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PRELIMINARY DRAFT

Shasta Lake Water Resources Investigation

Environmental Impact Statement



U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

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Preliminary Draft Environmental Impact Statement

Shasta Lake Water Resources Investigation

United States Department of the Interior
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This Preliminary Draft Environmental Impact Statement (EIS) for the Shasta Lake Water Resources Investigation (SLWRI) has been prepared by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), Mid-Pacific Region, consistent with requirements of the National Environmental Policy Act (NEPA). Cooperating agencies pursuant to NEPA include the U.S. Forest Service, Bureau of Indian Affairs, Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians, and U.S. Army Corps of Engineers. A companion document to the Preliminary Draft EIS, the Draft Feasibility Report, has been published under separate cover.

This Preliminary Draft EIS evaluates the potential environmental effects of alternative plans to enlarge Shasta Dam and Reservoir to (1) increase anadromous fish survival in the upper Sacramento River, primarily upstream from Red Bluff Diversion Dam, (2) increase water supplies and water supply reliability for agricultural, municipal and industrial, and environmental purposes, and (3) address related water resource problems, needs, and opportunities. In addition to the No-Action Alternative, this Preliminary Draft EIS considers five action alternatives, which include potential dam raises ranging from 6.5 to 18.5 feet and related reservoir enlargements ranging from 256,000 to 634,000 acre feet.

The SLWRI is a feasibility study that is one of five studies for potential surface water storage projects included in the 2000 CALFED Bay-Delta Programmatic Record of Decision, and is being conducted under the general authority of Public Laws 96-375, which was reaffirmed under Public Law 108-361, also known as the CALFED Bay-Delta Authorization Act. Reclamation is releasing the Preliminary Draft EIS and Draft Feasibility Report to share the information generated since completion of the Plan formulation Report in 2007.

Release of these documents is intended to inform interested agencies, organizations, and individuals of the potential impacts, costs, and benefits of the alternative analyzed to-date. A complete Draft EIS will be prepared and processed for formal public review and comment, consistent with NEPA, following additional refinements to the action alternatives with changes in regulatory conditions in the Sacramento-San Joaquin Delta affecting operations of the State and Federal water projects.

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Shasta Lake Water Resources Investigation, California

**Preliminary Draft
Environmental Impact Statement**

Prepared by:

**United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Region**



**U.S. Department of the Interior
Bureau of Reclamation**

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Summary

S.1 Introduction

This Preliminary Draft Environmental Impact Statement (PDEIS) has been prepared to evaluate the potential environmental, cultural, and socioeconomic effects of implementing the proposed action to modify the existing Shasta Dam and Reservoir as part of the ongoing Shasta Lake Water Resources Investigation (SLWRI). The SLWRI is a feasibility study being conducted by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), Mid-Pacific Region, and includes this PDEIS and the accompanying Draft of the *Shasta Lake Water Resources Investigation Feasibility Report* (Feasibility Report) and appendices. Reclamation is serving as the Federal lead agency for compliance with the National Environmental Policy Act (NEPA). Cooperating agencies for the SLWRI, pursuant to NEPA, include U.S. Forest Service (USFS), Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians, U.S. Army Corps of Engineers, and U.S. Bureau of Indian Affairs. This document has also been prepared in accordance with the California Environmental Quality Act (CEQA).

The purpose of the proposed action is to improve operational flexibility of the Sacramento-San Joaquin Delta (Delta) watershed system through modifying the existing Shasta Dam and Reservoir to increase water supply reliability for agricultural, municipal and industrial, and agricultural purposes, and increase anadromous fish survival in the upper Sacramento River, and address other related resource needs.

Public Law 96-375 (October 3, 1980) provides feasibility study authority for the SLWRI and allows the Secretary of the Interior to do the following:

...engage in feasibility studies relating to enlarging Shasta Dam and Reservoir, Central Valley Project, California or to the construction of a larger dam on the Sacramento River, California, to replace the present structure.

Section 103(c), “Authorizations for Federal Activities Under Applicable Law,” of the CALFED Bay-Delta Authorization Act (Public Law 108-361, October 25, 2004), authorizes the Secretary of the Interior to carry out the activities described in paragraphs (1) through (10) of Subsection (d), which include the following:

Shasta Lake Water Resources Investigation
Environmental Impact Statement

... (1)(A)(i) planning and feasibility studies for projects to be pursued with project-specific study for enlargement of (1) the Shasta Dam in Shasta County.

Also, Section 103(a)(1) of Public Law 108-361 (October 25, 2004) states the following:

The Record of Decision is approved as a general framework for addressing the CALFED Bay-Delta Program, including its components relating to water storage, ecosystem restoration, water supply reliability (including new firm yield), conveyance, water use efficiency, water quality, water transfers, watersheds, the Environmental Water Account, levee stability, governance, and science.

The CALFED Bay-Delta Program (CALFED) Programmatic Record of Decision (ROD) called for the Secretary of the Interior to do the following:

... engage in feasibility studies for the purpose of determining the potential costs, benefits, environmental impacts, and feasibility of using the Sacramento River for conveying water from the enlarged Shasta Dam and Reservoir or the larger dam to points of use downstream from the dam.

Other Federal legislation influences the SLWRI. Two laws of special note are Public Law 89-336 (November 8, 1965) and Public Law 102-575 (October 30, 1992). Public Law 89-336 created the Whiskeytown-Shasta-Trinity National Recreation Area, which includes Shasta Dam and Reservoir. Public Law 102-575, the Central Valley Project Improvement Act, directed numerous changes to the operation of the Central Valley Project (CVP). Among these changes was adding fish and wildlife protection, restoration, and enhancement as a project purpose, which resulted in substantial changes to water supply deliveries, river flows, and related environmental conditions in the study area.

S.1.1 Intended Use of This Preliminary Draft Environmental Impact Statement

Release of this Preliminary Draft EIS, the Draft Feasibility Report, and their appendices presents SLWRI findings to date, and provides another opportunity for public and stakeholder input.

S.1.2 Intended Use of Final Environmental Impact Statement

An environmental impact statement (EIS) identifies and evaluates alternatives that meet the project purpose and can also avoid project-related impacts, analyzes the environmental effects of an action, and indicates additional measures to reduce or avoid potential environmental effects resulting from the action alternatives (i.e., mitigation measures). An EIS must also disclose significant environmental effects that cannot be avoided, growth-inducing effects, significant cumulative impacts, and effects found not to be significant.

The purpose of an EIS is not to recommend approval or rejection of a project, but to provide information to aid the public and decision makers/permitting agencies in the decision-making process.

This EIS, when finalized, is intended to be used by the Federal lead agency when considering approval of the proposed action or an alternative to the proposed action. All cooperating agencies, responsible agencies, and other Federal, State, and local agencies with permitting or approval authority over any aspect of the proposed action are expected to use the information contained in the Final SLWRI EIS to meet most, if not all, of their information needs to make decisions and/or issue permits with respect to the proposed action.

S.2 Purpose and Need for Proposed Action and Project Objectives

NEPA regulations require a statement of “the underlying purpose and need to which the agency is responding in proposing the alternatives, including the proposed action,” described below. The State CEQA Guidelines require a clearly written statement of objectives, including the underlying purpose of a project (Section 15124(b)), also described below.

S.2.1 Purpose and Need

The purpose of the proposed action is to improve operational flexibility of the Sacramento-San Joaquin Delta (Delta) watershed system through modifying the existing Shasta Dam and Reservoir to increase water supply reliability and anadromous fish populations in the upper Sacramento River. Specifically, the purpose of the proposed action is to accomplish all of the following:

- Promote increased survival of anadromous fish populations in the upper Sacramento River, primarily upstream from the location of the Red Bluff Diversion Dam (RBDD).
- Increase water supplies and water supply reliability for agricultural, municipal and industrial, and environmental purposes to help meet current and future water demands.
- To the extent possible, through meeting these objectives, include features that conserve and restore ecosystem resources in the Shasta Lake area and along the upper Sacramento River, reduce flood damage along the Sacramento River, increase hydropower capabilities at Shasta Dam, maintain and increase recreation opportunities at Shasta Lake, and maintain or improve water quality conditions in the Sacramento River downstream from Shasta Dam and in the Delta.

The need for the proposed action is described below and summarized from the 2007 Reclamation *Shasta Lake Water Resources Investigation Plan*

Formulation Report, the 2004 Reclamation *Shasta Lake Water Resources Investigation Initial Alternatives Information Report*, and the Plan Formulation Appendix.

S.2.1.1 Anadromous Fish Survival

The Sacramento River system is unique in California in that it supports four separate runs of Chinook salmon: fall-, late fall-, winter-, and spring-run. The adult populations of the four runs of salmon and other important fish species that spawn in the upper Sacramento River have considerably declined over the last 40 years. Several fish species in the upper Sacramento River have been listed under the Federal Endangered Species Act: Sacramento River winter-run Chinook salmon (endangered), Central Valley spring-run Chinook salmon (threatened), Central Valley steelhead (threatened), and the Southern Distinct Population Segment of North American green sturgeon (threatened). Two of these species are also listed under the California Endangered Species Act: Sacramento River winter-run Chinook salmon (endangered) and Central Valley spring-run Chinook salmon (threatened).

Unsuitable water temperatures in the upper Sacramento River, especially in dry and critically dry years, is a critical factor affecting the abundance of Chinook salmon and steelhead in the river. Releases of cold water stored behind Shasta Dam can improve seasonal water temperatures in the Sacramento River for anadromous fish, particularly winter-run Chinook salmon, during critical periods. Prolonged droughts depleting the cold-water storage in Shasta Reservoir could extirpate the entire Sacramento River winter-run Chinook salmon population. Under current conditions, even 2 consecutive years of drought could reduce Shasta Reservoir cold-water storage to levels insufficient to support the Sacramento River winter-run Chinook spawning and incubation season. This could result in complete year-class failure, virtually eliminating all of a single year's spawning and incubating winter-run Chinook in the Sacramento River. Various actions have been taken to address these problems, ranging from minimum instream flow requirements to structural changes at Shasta Dam. Despite these steps, additional actions are needed to address anadromous fish survival in the upper Sacramento River.

S.2.1.2 Water Supply Reliability

Demands for water in the state of California exceed available supplies. Reclamation's 2008 *Water Supply and Yield Study* describes dramatic increases in statewide population, land use changes, regulatory requirements, and limitations on storage and conveyance facilities have resulted in unmet water demands and subsequent increases in competition for water supplies among urban, agricultural, and environmental uses. The 2009 *California Water Plan Update* concludes that California is facing one of the most significant water crises in its history; drought impacts are growing, ecosystems are declining, water quality is diminishing, and climate change is affecting statewide hydrology. Challenges are greatest during drought years, when water supplies are less available.

As the population of California grows, and the demand for adequate water supplies becomes more acute, the ability to maintain a healthy and viable industrial and agricultural economy while protecting aquatic species will be increasingly difficult. Compounding these issues, potential effects of climate change such as changed precipitation patterns, less snowfall, and earlier snowmelt may considerably increase the demands on available water supplies in the future. As owner and operator of the CVP, one of the largest water storage and conveyance systems in the world, Reclamation has identified the need to increase the reliability of CVP water deliveries to its water contractors, particularly during dry and critically dry water years. Similar needs and challenges are faced by the SWP and other water projects throughout the State. As one of many efforts to improve the reliability of California's water supply, the SLWRI was established to evaluate the potential to improve water supply reliability primarily by modifying Shasta Dam and enlarging Shasta Lake.

S.2.1.3 Other Resources

Reclamation has identified other resource needs that could be addressed through potential modification of Shasta Dam and Reservoir. Escalating demands on statewide electricity production, continuing modification of natural aquatic and riparian habitats in the Sacramento River system, increasing threats of potential flooding in the Sacramento River system, and greater demands for recreational opportunities are all potential local, regional, or statewide problems exacerbated by California's population growth in general and particularly in the Sacramento Valley. The SLWRI provides opportunities to address these other resource needs, as well as the primary SLWRI objectives of increased anadromous fish survival and water supply reliability.

S.2.2 Project Objectives

To address the identified purpose and need described above, two primary project (i.e., planning) objectives were developed for the SLWRI. Five secondary project objectives were developed to take advantage of other beneficial project opportunities.

S.2.2.1 Primary Project Objectives

Primary project objectives are those which specific alternatives are formulated to address. Primary project objectives developed for the SLWRI are as follows:

- Increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the RBDD.
- Increase water supply and water supply reliability for agricultural, municipal and industrial, and environmental purposes to help meet current and future water demands, with a focus on enlarging Shasta Dam and Reservoir.

The primary project objectives are considered to have coequal priority, with each pursued to the maximum practicable extent without adversely affecting the other.

S.2.2.2 Secondary Project Objectives

Secondary project objectives are actions, operations, or features that should be considered in the plan formulation process, but only to the extent possible through pursuit of the primary objectives. Five secondary project objectives were developed for the SLWRI:

- Conserve, restore, and enhance ecosystem resources in the Shasta Lake area and along the upper Sacramento River.
- Reduce flood damage along the Sacramento River.
- Develop additional hydropower generation capabilities at Shasta Dam.
- Maintain and increase recreation opportunities at Shasta Lake.
- Maintain or improve water quality conditions in the Sacramento River downstream from Shasta Dam and the Delta.

S.3 Study Area

Shasta Dam and Shasta Lake are located on the upper Sacramento River in Northern California, approximately 9 miles northwest of Redding in Shasta County. Because of the potential influence of the proposed modification of Shasta Dam and Reservoir and subsequent system operations and water deliveries on resources over a large geographic area, the SLWRI includes both a primary study area and an extended study area. The primary study area includes Shasta Dam and Reservoir, the lower portions of all contributing major and minor tributaries flowing into Shasta Lake, Trinity and Lewiston reservoirs, and the Sacramento River between Shasta Dam and the RBDD facilities, including tributaries at their confluence. The RBDD is directly adjacent to the Red Bluff Pumping Plant (RBPP), which is currently under construction. The extended study area includes the Sacramento River downstream from the RBDD, including portions of the American and Feather river basins downstream from CVP/State Water Project (SWP) facilities, San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta), lower portions of the San Joaquin River basin downstream from CVP facilities (Friant and New Melones reservoirs), and facilities and water service areas of the CVP and SWP.

S.4 Summary Description of Alternatives

The following sections summarize the no-action and five action alternatives evaluated in the PDEIS.

S.4.1 No-Action Alternative

For the SLWRI, under the No-Action Alternative, the Federal Government would continue to implement reasonably foreseeable actions, including actions with current authorization, secured funding for design and construction, and environmental permitting and compliance activities that are substantially complete, but would not take additional actions toward implementing a plan to raise Shasta Dam to help increase anadromous fish survival in the upper Sacramento River, nor help address the growing water supply and reliability issues in California. The following discussions highlight the consequences of implementing the No-Action Alternative, as they relate to the objectives of the SLWRI.

Anadromous Fish Survival

Much has been done to address anadromous fish survival problems in the upper Sacramento River. Solutions have ranged from changes in the timing and magnitude of releases from Shasta Dam to constructing and operating the temperature control device (TCD) at the dam. Actions also include site-specific projects, such as introducing spawning gravel to the Sacramento River, and work to improve or restore spawning habitat in tributary streams. However, some actions have had an adverse effect on Sacramento River habitat, including implementing requirements of the Trinity River ROD, as amended in 2000. Increased demand for water for agricultural, municipal and industrial, and environmental uses is also expected to reduce the reliability of cold water for anadromous fish. According to 2009 National Marine Fisheries Service *Public Draft Recovery Plan*, under the No-Action Condition, a drought lasting several years would likely result in the extirpation of winter run Chinook salmon. Under the No-Action Alternative, it is assumed that actions to protect fisheries and benefit aquatic environments would continue, including maintaining the TCD and satisfying other existing regulatory requirements.

Water Supply Reliability

Demands for water in California will continue to exceed available supplies, and the need for additional supplies is expected to grow. Competition for available water supplies would intensify as water demands increase to support population growth. Water conservation and reuse efforts are expected to significantly increase, and forced conservation as the result of increasing water shortages would continue. It is likely that with continued and deepening shortages in available water supplies, adverse economic impacts would increase over time in the Central Valley and elsewhere in California.

Ecosystem Resources, Flood Management, Hydropower, Recreation, and Water Quality

As opportunities arise, some locally sponsored efforts will likely continue to improve environmental conditions on tributaries to Shasta Lake and along the upper Sacramento River. However, overall, future environmental-related conditions in these areas will likely be similar to existing conditions. The quantity, quality, diversity, and connectivity of riparian, wetland, and riverine habitats along the Sacramento River have been limited by confinement of the river system by levees, reclamation of adjacent lands for farming, bank protection, channel stabilization, and land development.

Under the No-Action Alternative, the threat of flooding would continue, and may increase as population growth continues. California's demand for electricity is also expected to increase substantially in the future. Under the No-Action Alternative, no actions would be taken to help meet this growing demand.

To address the impact of water quality deterioration on the Sacramento River basin and Delta ecosystems, several environmental flow goals have been established through legal mandates. Despite these efforts, under the No-Action Alternative, these resources would continue to decline and ecosystems would continue to be impacted. In addition, Delta water quality may continue to decline.

S.4.2 Management Measures Common to All Action Alternatives

Eight of the management measures identified during the alternatives development process would be included in all action alternatives to some degree:

- Enlarge the cold-water pool of Shasta Lake
- Modify the TCD
- Increase water conservation storage
- Reduce water demand
- Modify flood operations
- Modify hydropower facilities
- Maintain and increase recreation opportunities
- Maintain or improve water quality

These eight common management measures are described below.

All action alternatives would involve, at a minimum, enlarging the cold-water pool by raising Shasta Dam to enlarge Shasta Reservoir. Minimum modifications to the TCD under all action alternatives would include raising the existing structure and modifying the shutter control. All action alternatives

would also increase the conservation storage in Shasta Reservoir by raising Shasta Dam. To reduce water demand, all action alternatives would include an additional water conservation program for new water supplies created by the project. This program would augment current water use efficiency practices. Enlarging Shasta Reservoir would require adjustment of the existing flood operation guidelines, or rule curves, to reflect physical modifications such as an increase in dam/spillway elevation; the rule curves would be revised with the goal of reducing flood damage and enhancing other objectives to the extent possible. Enlarging Shasta Dam would probably also require various modifications to the dam's existing hydropower facilities to enable their continued efficient use. Recreation is important to the Shasta Lake region; therefore, existing recreation opportunities would be maintained and/or increased. All action alternatives would maintain and potentially improve water quality by increasing Delta outflow during drought years and reducing salinity during critical periods, and may also provide operational flexibility for Delta emergency response.

S.4.3 Alternative CP1

Comprehensive Plan (CP) 1 focuses on both anadromous fish survival and water supply reliability. CP1 consists of enlarging Shasta Dam by raising the crest 6.5 feet and implementing the set of eight common management measures described above. By raising Shasta Dam from a crest at elevation 1,077.5 feet above mean sea level (elevation 1,077.5) to elevation 1,084.0, this alternative would increase the height of the reservoir's full pool by 8.5 feet. The additional 2-foot increase in the height of the full pool above the dam raise height would result from spillway modifications, including replacing the three drum gates with six sloping, fixed-wheel gates. This increase in full pool height would add approximately 256,000 acre-feet of additional storage to the overall reservoir capacity. Accordingly, the overall full pool storage would increase from 4.55 million acre-feet (MAF) to 4.81 MAF.

Under CP1, operations for water supply, hydropower, and environmental requirements would be similar to existing operations, with the additional storage retained for water supply reliability and as an expanded cold-water pool for fisheries benefits. As mentioned, this alternative (and all action alternatives) includes extending the existing TCD for efficient use of the expanded cold-water pool.

CP1 would also include the potential to revise the operational rules for flood control for Shasta Dam and Reservoir, which could reduce the potential for flood damage, and benefit recreation. Reservoir reoperation may provide recreation benefits by raising the bottom of the flood control pool elevation and, thus, allowing higher winter and spring water levels and increasing Shasta Lake's surface area. In addition, reservoir reoperation may provide more operational flexibility in reservoir drawdown requirements in response to storms, resulting in a net increase in the rate of spring reservoir filling during some years.

S.4.4 Alternative CP2

CP2 also focuses on both anadromous fish survival and water supply reliability. CP2 consists of enlarging Shasta Dam by raising the crest 12.5 feet and implementing the set of eight common management measures described above. A dam raise of 12.5 feet was chosen because it represents a midpoint between the likely smallest dam raise considered and the largest practical dam raise that would not require relocating the Pit River Bridge. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,090.0, CP2 would increase the height of the reservoir's full pool by 14.5 feet. This increase in full pool height would add approximately 443,000 acre-feet of storage to the reservoir's capacity.

Accordingly, storage in the overall full pool would increase from 4.55 MAF to 5.0 MAF.

Under CP2, operations for water supply, hydropower, and environmental requirements would be similar to existing operations, with the additional storage retained for water supply reliability and as an expanded cold-water pool for fisheries benefits. The existing TCD would be extended for efficient use of the expanded cold-water pool.

As described for CP1, this alternative would also include the potential to revise flood control operational rules, which could reduce the potential for flood damage and benefit recreation.

S.4.5 Alternative CP3

As for CP1 and CP2, CP3 focuses on both anadromous fish survival and water supply reliability. CP3 consists of enlarging Shasta Dam and Reservoir by raising the dam crest 18.5 feet and implementing the set of eight common management measures described above.

By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0, CP3 would increase the height of the reservoir's full pool by 20.5 feet. This increase in full pool height would add approximately 634,000 acre-feet of storage to the reservoir's capacity. Accordingly, storage in the overall full pool would be increased from 4.55 MAF to 5.19 MAF. Although higher dam raises are technically and physically feasible, 18.5 feet is the largest dam raise that would not require extensive and costly reservoir area relocations, such as relocating the Pit River Bridge, Interstate-5, and the Union Pacific Railroad tracks.

Under CP3, operations for water supply, hydropower, and environmental requirements would be similar to existing operations, with the additional storage retained for water supply reliability and as an expanded cold-water pool for fisheries benefits. The existing TCD would be extended for efficient use of the expanded cold-water pool.

As described for the above alternatives, this alternative would also include the potential to revise flood control operational rules, which could reduce the potential for flood damage and benefit recreation.

S.4.6 Alternative CP4

CP4 focuses on increasing anadromous fish survival by raising Shasta Dam 18.5 feet, while also increasing water supply reliability. In addition to raising the dam and implementing the set of eight common management measures described above, CP4 would dedicate part of the increased storage in Shasta Lake to maintaining cold-water volumes.

The additional storage created by the 18.5-foot dam raise would be used to both improve the ability to meet water temperature objectives for winter-run Chinook salmon during drought years and increase water supply reliability. The reservoir's capacity would increase by 634,000 acre-feet to a total of 5.19 MAF. Of the increased reservoir storage space, about 378,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes.

Operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as for CP1, while the cold-water pool would be subject to an adaptive management plan that may include operational changes to the timing and magnitude of release from Shasta Dam to benefit anadromous fish. The existing TCD would be extended to achieve efficient use of the expanded cold-water pool.

As described for the above alternatives, this alternative would also include the potential to revise flood control operational rules, which could reduce the potential for flood damage and benefit recreation.

Two additional ecosystem restoration features under CP4 would include augmenting spawning gravel in the upper Sacramento River at targeted locations to provide either immediate spawning habitat or long-term recruitment, and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River to provide rearing habitat for juvenile salmonids.

S.4.7 Alternative CP5

CP5 focuses on anadromous fish survival, increased water supply reliability, ecosystem enhancements in the Shasta Lake area and the upper Sacramento River upstream from the RBDD facilities, and increased recreation opportunities around Shasta Lake. CP5 consists of raising Shasta Dam 18.5 feet; constructing additional resident fish habitat in Shasta Lake and along the lower reaches of its tributaries (the Sacramento River, the McCloud River, and Squaw Creek); constructing shoreline fish habitat around Shasta Lake; augmenting spawning gravel in the upper Sacramento River; restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; increasing recreation

opportunities at Shasta Lake; and implementing the set of eight common management measures described above.

The additional storage created by the 18.5-foot dam raise would be used primarily to increase water supply reliability, while also improving the ability to meet water temperature objectives for winter-run Chinook salmon during drought years. The reservoir's capacity would increase by 634,000 acre-feet to a total of 5.19 MAF.

Under CP5, operations for water supply, hydropower, and environmental requirements would be similar to existing operations, with the additional storage retained for water supply reliability and as an expanded cold-water pool for fisheries benefits. The existing TCD would be extended to achieve efficient use of the expanded reservoir.

As described the above alternatives, this alternative would also include the potential to revise flood control operational rules, which could reduce the potential for flood damage and benefit recreation.

S.5 Alternatives Considered and Eliminated

Formulation of a range of comprehensive alternatives for evaluation in this PDEIS began with a review of problems, needs, and opportunities identified and defined previously, study authorities, and other pertinent direction, including information contained in the 2000 CALFED ROD, followed by development of primary and secondary planning objectives, and, finally, development of comprehensive alternatives to meet the project purpose and need. Some project alternatives suggested during this process were not retained because they did not adequately meet, or were beyond the scope of, the purpose and need statement, did not contribute to both primary planning objectives, or had high social or environmental impacts.

S.6 Major Conclusions of Environmental Analysis

An environmental document prepared to comply with NEPA must consider the context and intensity of the environmental effects that would be caused by, or result from, the proposed action. Under NEPA, the significance of an effect is a determining factor in whether an EIS must be prepared. An environmental document prepared to comply with CEQA must identify the significance of the environmental effects of a proposed project. As stated in State CEQA Guidelines, Section 15382, a “[s]ignificant effect on the environment means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project.”

S.6.1 Methods and Assumptions

The PDEIS analyzes the direct and indirect effects of the No-Action Alternative and comprehensive plans (i.e., action alternatives) for each environmental resource area. Direct effects are those that would be caused by the action and would occur at the same time and place. Indirect effects are reasonably foreseeable consequences that may occur at a later time or at a distance from the project area. Examples of indirect effects are growth inducement and other effects related to changes in land use patterns, population density, or growth rate, and related effects on the physical environment.

The effects of the No-Action Alternative and action alternatives were determined by comparing estimates of resulting conditions with baseline conditions. These baseline conditions differ between NEPA and CEQA. Under NEPA, the No-Action Alternative (i.e., expected future conditions without the project) is the baseline to which the action alternatives are compared; the No-Action Alternative is also compared to existing conditions. Under CEQA, existing conditions are the baseline to which alternatives are compared.

Uncertainties Affecting Definition of Reasonably Foreseeable/Without-Project Conditions

Federal water resources planning and NEPA procedures require the application of best available information, sound science, and definition of a reasonably foreseeable future condition as the basis for comparing the potential effects of alternative plans, which leads to identification of a recommended plan and/or action and supports decision making. A variety of physical, environmental, socioeconomic, regulatory, and operational conditions and uncertainties in the Bay-Delta and related watersheds is impacting the SLWRI's ability to establish a reasonably foreseeable future condition. These same challenges are affecting other water resource studies, operations, and management actions in the Bay-Delta and related watersheds.

Plan formulation efforts and analysis of the No-Action Alternative and action alternatives discussed in this chapter are based on CVP and SWP operational conditions described Reclamation's 2004 *Long-Term CVP and SWP Operations Criteria and Plan (OCAP) Biological Assessment*. Modeling studies will be updated to reflect changes in water operations resulting from ongoing OCAP reconsultation and other relevant water resources projects and programs, including, potentially, Bay-Delta Conservation Plan/Delta Habitat Conservation and Conveyance Plan efforts. The results of these updated studies will be incorporated into the Draft EIS and other future SLWRI documents.

Effects of Project Implementation with Climate Change

Council on Environmental Quality guidance, issued February 18, 2010, suggests that Federal agencies consider opportunities to reduce greenhouse gas (GHG) emissions caused by proposed Federal actions, adapt their actions to climate change impacts throughout the NEPA process, and address these issues in the

agencies' NEPA procedures. Following are the two main factors to consider when addressing climate change in environmental documentation:

- Effects of a proposed action and alternative actions on GHG emissions
- Impacts of climate change on a proposed action or alternatives

Council on Environmental Quality notes that “significant” national policy decisions with “substantial” GHG impacts require analysis of their GHG effects. That is, the GHG effects of a Federal agency’s proposed action must be analyzed if the action would cause “substantial” annual direct emissions; would implicate energy conservation or reduced energy use or GHG emissions; or would promote cleaner, more efficient renewable-energy technologies. Qualitative or quantitative information on GHG emissions that is useful and relevant to the decision should be used when deciding among alternatives.

Each resource area analyzed in the PDEIS evaluates the effects of comprehensive plans combined with predicted effects of climate change. The ways SLWRI comprehensive plans could affect GHG production are also addressed. The Climate Change Projection Appendix provides a summary of global climate forecasts and climate change implications for California water resources are discussed, particularly those of Shasta Lake, including predictions about changes in monthly and annual natural runoff, reservoir storage and temperature, flood management, power generation, fish conservation, and water supply and quality. The discussion of climate change implications provided in the Climate Change Projection Appendix provides the context for consideration of cumulative conditions.

S.6.2 Summary of Impacts

The action alternatives would affect environmental resources in the primary and extended study areas. The primary study area is the area surrounding Shasta Dam and Reservoir, and the Sacramento River corridor from Shasta Dam downstream to the RBDD facilities. The extended study area consists of the lower Sacramento River and the lower portion of major tributaries, the Delta, and the CVP/SWP water service areas, which includes a substantial portion of California, such as much of Southern California. Some of the impacts would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation. Other impacts would be permanent, some of which would remain significant and unavoidable despite proposed mitigation measures. In addition, some effects of the project would be beneficial.

Table S-1, included at the end of this summary, summarizes the environmental impacts of the action alternatives, the duration and quantification of each impact, the level of significance of each impact before mitigation, recommended mitigation measures and the level of significance of each impact after mitigation.

S.6.3 Significant and Unavoidable Impacts

As shown in Table S-1, the action alternatives would likely result in the following significant and unavoidable direct and indirect impacts:

- **Botanical Resource** – Loss of Multi-Species Conservation Strategy (MSCS) covered species; loss of USFS sensitive, U.S. Bureau of Land Management (BLM) sensitive, or California Rare Plant Rank (CRPR) species; loss of jurisdictional waters; and loss of general vegetation habitats (all action alternatives).
- **Wildlife Resources** – Take and loss of habitats for the Shasta salamander, bald eagle, northern spotted owl, and Pacific fisher; impact on the foothill yellow-legged frog, tailed frog, northwestern pond turtle, purple martin, special-status bats, American marten, ringtail, terrestrial mollusks, and their habitat; impact on willow flycatcher, Vaux’s swift, yellow warbler, yellow-breasted chat, long-eared owl, northern goshawk, Cooper’s hawk, great blue heron, and osprey, and their foraging and nesting habitat; permanent loss of general wildlife habitat; take and loss of foraging and nesting habitat for other birds of prey and migratory bird species; and loss of critical deer winter and fawning range (all action alternatives).
- **Geology, Geomorphology, Minerals, and Soils** – Loss or diminished availability of known mineral resources; loss or diminished soil biomass productivity; and soil erosion or loss of topsoil due to shoreline processes (all action alternatives).
- **Air Quality and Climate** – Short-term emissions of criteria air pollutants and precursors during project construction (all action alternatives).
- **Agriculture and Important Farmlands** – Direct and indirect conversion of forest land to nonforest uses in the vicinity of Shasta Lake (all action alternatives).
- **Land Use and Planning** – Conflicts with existing land use goals and policies of affected jurisdictions (Shasta Lake and vicinity and upper Sacramento River), and disruption of existing land uses (Shasta Lake and vicinity and upper Sacramento River) (all action alternatives).
- **Cultural Resources** – Inundation of traditional cultural properties and sacred sites (all action alternatives).
- **Aesthetics and Visual Resources** – Consistency with guidelines for visual resources in the USFS 1995 *Shasta-Trinity National Forest Land and Resource Management Plan*; degradation and/or obstruction of a

scenic view from key observation points; and generation of increased daytime glare and/or nighttime lighting (all action alternatives).

- **Wild and Scenic River Considerations for McCloud River** – Effect on McCloud River’s eligibility for listing as a Federal Wild and Scenic River; conflicts with the USFS 1995 *Shasta-Trinity National Forest Land and Resource Management Plan* or USFS 1995 *Coordinated Resource Management Plan*; and conflicts with the California Public Resources Code, Section 5093.542 (all action alternatives).

The action alternatives could also result in the following significant and unavoidable cumulative impacts (i.e., an impact would make a considerable contribution to a significant cumulative effect):

- **Hydrology, Hydraulics, and Water Management** – Cumulative effects on south Delta water levels, X2 position, and Delta outflow (all action alternatives).
- **Botanical Resources and Wetlands** – Cumulative effects from increased water delivery in the service areas and growth-related loss of sensitive plant communities and special-status plant species (all action alternatives).
- **Wildlife Resources** – Cumulative effects from inundation at Shasta Lake, leading to take and loss of habitat for numerous special-status species at Shasta Lake and vicinity (all action alternatives).
- **Geology, Geomorphology, Minerals, and Soils** – Cumulative effects from use of soil and mineral resources, leading to diminished regional availability of cement, concrete sand, and aggregate and loss of soil productivity (all action alternatives).
- **Aesthetics and Visual Resources** – Changes to aesthetic values and resources at Shasta Lake (all action alternatives).
- **Environmental Justice** – Cumulative effects from disproportionate placement of environmental impacts on Native American populations, leading to disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance in the vicinity of Shasta Lake (all action alternatives).
- **Air Quality and Climate** – Cumulative effects from emissions of NO_x during project construction (all action alternatives).

S.6.4 Environmental Commitments

As part of project planning and environmental assessment, Reclamation and/or its contractors would incorporate certain environmental commitments and best management practices into the action alternatives to avoid or minimize potential impacts. Reclamation will also coordinate planning, engineering, design and construction, operation, and maintenance phases of the project with applicable resource agencies.

The following environmental commitments would be incorporated into any action alternative for any project-related construction activities:

- Develop and implement a construction management plan to avoid or minimize potential impacts to public health and safety during project construction.
- Comply with applicable laws, policies, and plans for this project.
- Develop and implement an erosion and sediment control plan to control short-term and long-term erosion and sedimentation effects, and to stabilize soils and vegetation in areas affected by construction activities.
- Develop and implement a stormwater pollution prevention plan to prevent or minimize the discharge of sediments and other contaminants with the potential to affect beneficial uses or lead to violations of water quality objectives of surface waters.
- Develop and implement a feasible spill prevention and hazardous materials management plan to minimize effects from spills of hazardous, toxic, or petroleum substances for project-related activities occurring in or near waterways.
- Implement in-water construction work windows to occur when sensitive fish species are not present, or would be least susceptible to disturbance (e.g., July through September).
- Monitor potential impacts to important fishery resources throughout all phases of project construction.
- Perform fish rescue/salvage for fish entrapped within construction structures and cofferdam enclosures, and stop construction activities for spawning activities for sensitive fish species.
- Prepare a comprehensive revegetation plan to be implemented in conjunction with other management plans (e.g., erosion and sediment control plan).

- Develop and require implementation of a control plan to prevent the introduction of zebra/quagga mussels and other invasive species to project areas.
- Recycle or reuse demolished construction materials where practical.
- Demolish and remove all asphaltic roadways and parking lots inundated by the proposed Shasta Dam raise, per California Department of Fish and Game Code 5650 Section (a).

S.7 Areas of Controversy and Issues to Be Resolved

Several areas of controversy and issues to be resolved have been identified in the SLWRI to date.

S.7.1 Areas of Controversy

Federal, State, and local stakeholders have identified several areas of controversy during the SLWRI scoping process and agency meetings and workshops. Key topics include potential adverse effects on cultural resources in the Shasta Lake area; recreation and recreation providers in the Whiskeytown-Shasta-Trinity National Recreation Area; terrestrial special-status species around Shasta Lake, including State-designated fully protected species, aquatic special-status species in the Sacramento River and Delta (including delta smelt); the lower McCloud River and its special designation under California Public Resources Code 5093.542(c); Delta water quality and south Delta water levels; Central Valley hydrology below CVP and SWP facilities and resulting effects on water supplies for water contractors and other water users; impacts on reservoir area property owners; reservoir reoperation for flood control; and consistency with the 2000 CALFED ROD.

S.7.2 Issues to Be Resolved

As the SLWRI progresses, various issues will need to be addressed and resolved. Subject areas that have been identified to date are described below.

Native American Concerns and Cultural Resources

This PDEIS and accompanying Draft Feasibility Report are consistent with the National Historic Preservation Act Section 106, and describe supporting analyses, studies, coordination, impacts, and mitigation, as necessary.

Reclamation has invited Federally recognized tribes and non-Federally recognized tribal groups to be consulting parties to the SLWRI. Although no Federally recognized tribes reside in the immediate Shasta Lake area, members of the Winnemem band of the Wintu Indians have raised concerns about potential impacts of enlarging Shasta Dam on sites they value for historic and cultural significance. Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians is a cooperating agency for the SLWRI, pursuant to NEPA. The Winnemem Wintu will continue to have the opportunity to

participate and are anticipated to continue to provide input, through the Section 106 process as an invited consulting party, as well as through the NEPA process.

Impacts on Biological Resources

The physical environment and associated landscapes within and adjacent to the primary study area provide for a wide array of habitat used by a diverse assemblage of wildlife with varying habitat needs and home ranges. To date, species-specific survey efforts as part of the SLWRI have only included focused investigations for a number of special-status species in the inundation and relocation areas described previously. The scale of these surveys has been limited, and because of a variety of external factors, have not addressed habitat for species with a large home range or at a watershed scale. Therefore, for species that have large home ranges (e.g., Pacific fisher), or that use a wide range of habitats for some aspect of their life history, analyses presented in this document assume presence over a conservatively large geographic area to cover the full range of impacts anticipated for these species.

Off-Site Mitigation for Impacts on Biological Resources

Details about off-site opportunities to mitigate impacts on biological resources in the primary study area are not yet available. Potential mitigation lands containing wetland and special-status species habitat comparable to those that would be affected by the proposed action have been identified near the study area. Additional discussion of how these lands may be applied as mitigation and at what ratios will be provided in future documents. A discussion of mitigation for loss of habitat through preservation and enhancement in mitigation areas will be included in future documents.

Water Rights

Improving the reliability of water supplies is a primary objective of the SLWRI. The water supply reliability benefits of the project alternatives are described in Chapter 2. Water rights for the expanded Shasta Reservoir, which are appropriated by the State Water Resources Control Board (SWRCB), must be in place before the project can operate. Evaluation of water rights will remain a focus of the SLWRI.

Coordinated CVP and SWP Operational Conditions

Planning assumptions and information on water operations used to develop alternatives during the SLWRI were developed in 2006, and reflect the coordinated CVP and SWP operations described in Reclamation's 2004 *Long-Term CVP Operations Criteria and Plan* (2004 OCAP). In addition, the model package used to evaluate potential effects of the alternatives included in this PDEIS was based on operations described in Reclamation's 2004 *Long-Term CVP and SWP OCAP Biological Assessment* (2004 OCAP BA).

Reclamation consulted with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) and U.S. Fish and

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Wildlife Service (USFWS) on the 2004 OCAP, and the two agencies issued the 2004 *Biological Opinion on the Long-Term CVP and SWP OCAP* (2004 NMFS BO) and 2005 *Reinitiation of Formal and Early Section 7 ESA Consultation on the Coordinated Operations of the CVP and SWP and the OCAP to Address Potential Critical Habitat Issues* (2005 USFWS BO), respectively. In 2007, the District Court for the Eastern District of California (District Court), in *Natural Resources Defense Council v. Kempthorne*, found the 2005 USFWS BO to be unlawful and inadequate. In May 2008, in *Pacific Coast Federation of Fishermen's Associations v. Gutierrez*, the District Court found the 2004 NMFS BO to be unlawful and inadequate. The District Court remanded both BOs to the fishery agencies.

In August 2008, Reclamation reinitiated consultation with the fishery agencies based on Reclamation's 2008 *Biological Assessment on the Continued Long-Term Operations of the CVP and SWP*. USFWS issued the *Formal ESA Consultation on the Proposed Coordinated Operations of the CVP and SWP* in December 2008, finding that the long-term operations of the CVP and SWP, as described in the 2004 OCAP BA, would jeopardize the continued existence of the delta smelt. In June 2009, NMFS issued the *BO and Conference Opinion on the Long-Term Operations of the CVP and SWP* (2009 NMFS BO), finding that the same operations would jeopardize populations of listed salmonids, steelhead, green sturgeon, and orcas. Because both agencies made jeopardy determinations, both agencies included a Reasonable and Prudent Alternative (RPA) in their respective BOs.

Several lawsuits were filed challenging the validity of the 2008 USFWS BO and 2009 NMFS BO and Reclamation's acceptance of the RPA included with each BO (*Consolidated Salmonid Cases*, *Delta Smelt Consolidated Cases*). On November 13, 2009, and March 5, 2010, the District Court concluded that Reclamation had violated NEPA by failing to perform any NEPA analysis before provisionally adopting the 2008 USFWS RPA and 2009 NMFS RPA. On December 14, 2010, the District Court found the 2008 USFWS BO to be unlawful and remanded the BO to USFWS. The District Court issued a similar ruling for the 2009 NMFS BO on September 20, 2011. On May 4, 2011, in the *Delta Smelt Consolidated Cases*, the District Court ordered USFWS to prepare a draft BO by October 1, 2011, which was subsequently extended to an unspecified date to be agreed upon by involved parties. Reclamation and USFWS must prepare a final BO and final NEPA document by November 1, 2013, and December 1, 2013, respectively.

Reclamation and DWR use CalSim-II to study operations, benefits, and effects of new facilities and operational parameters for the CVP and SWP. A set of operational assumptions was developed in 2006 based on water operations described in the 2004 OCAP BA and the Coordinated Operations Agreement between Reclamation and DWR for the CVP and SWP, as ratified by Congress. These assumptions were used to guide development, modeling, and evaluation of potential effects of the No-Action Alternative and action alternatives

included in this PDEIS. Rationale for the decision to use these existing evaluations as the basis of analysis in the PDEIS and accompanying Draft Feasibility Report is provided in Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences.” Modeling studies and associated analyses will be updated and included in the Draft EIS and other future SLWRI documents.

S.8 Public Involvement and Next Steps

This PDEIS will be published for public, stakeholder, and agency review. During this period, stakeholder workshops will be held to present key findings and solicit input.

A Draft EIS will be prepared considering input from stakeholders and the public and results of updated modeling studies. In accordance with NEPA review requirements, the Draft EIS will be circulated for public and agency review and comment for at least 60 days following the date when the U.S. Environmental Protection Agency publishes the notice of availability of weekly receipt of environmental impact statements in the *Federal Register*. Similar to the approach to public scoping, public meetings will be held in various locations statewide to solicit and receive public input on the Draft EIS. These meetings will be held during the public comment period so that any comments received at the meetings can be addressed in the FEIS. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted during the public comment period.

An FEIS will be prepared and circulated in accordance with NEPA requirements and will include responses to all comments. Reclamation will circulate the FEIS for at least 60 days before issuing its ROD. In the ROD, which is the final step in the EIS process, Reclamation will document its decision on which actions, if any, to take to address the primary objectives. It will also describe other risk reduction plans it considered, identify any mitigation plans, and describe factors and comments taken into consideration when making its decision.

To date, CEQA scoping has not been initiated. This process will not commence until a State lead agency is identified.

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Geology, Geomorphology, Minerals, and Soils						
Impact Geo-1: Exposure of Structures and People to Geologic Hazards, Resulting from Seismic Conditions, Slope Instability, and Volcanic Eruptions	N-A	NA	–	NI	No mitigation measures required.	NI
	CP1– CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-2: Alteration of Fluvial Geomorphology and Hydrology of Aquatic Habitats	N-A	NA	–	NI	No mitigation measures required.	NI
	CP1– CP5	Long-term	–	S	Mitigation Measure Geo-2: Replace Lost Ecological Functions of Existing Aquatic Habitats in the Vicinity of the Impact.	LTS
Impact Geo-3: Loss or Diminished Availability of Known Mineral Resources that Would Be of Future Value to the Region	N-A	NA	–	NI	No mitigation measures required.	NI
	CP1– CP5	Long-term	–	SU	No feasible mitigation available to reduce impact.	SU
Impact Geo-4: Lost or Diminished Soil Biomass Productivity	N-A	NA	–	NI	No mitigation measures required.	NI
	CP1	Long-term	Loss of 1,954.6 acres of moderate productivity land; 1604.5 acres of low productivity land; 565 acres of nonproductive land	SU	No feasible mitigation available to reduce impact.	SU
	CP2	Long-term	Loss of 2,128 acres of moderate productivity land; 1,751 acres of low productivity land; 638 acres of nonproductive land	SU	No feasible mitigation available to reduce impact.	SU
	CP3– CP5	Long-term	Loss of 2,301 acres of moderate productivity land; 2,092 acres of low productivity land; 760 acres of nonproductive land	SU	No feasible mitigation available to reduce impact.	SU

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Geo-5: Substantial Soil Erosion or Loss of Topsoil Due to Shoreline Processes	N-A	NA	—	NI	No mitigation measures required.	NI
	CP1	Short-term and long-term	—	SU	No feasible mitigation available to reduce impact.	SU
	CP2–CP3	Short-term and long-term	Similar to CP1, but greater	SU	No feasible mitigation available to reduce impact.	SU
	CP4	Short-term and long-term	Similar to CP1 & CP2, but greater	SU	No feasible mitigation available to reduce impact.	SU
	CP5	Short-term and long-term	Similar to CP1 & CP2, but greater	SU	No feasible mitigation available to reduce impact.	SU
	N-A	NA	—	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	—	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	—	NI	No mitigation measures required.	NI
Impact Geo-6: Substantial Soil Erosion or Loss of Topsoil Due to Upland Processes	N-A	CP1–CP5	Long-term	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-7: Be Located on a Geologic Unit or Soil that is Unstable, or that Would Become Unstable as a Result of the Project, and Potentially Result in Subsidence						
Impact Geo-8: Failure of Septic Tanks or Alternative Wastewater Disposal Systems Due to Soils that are Unsuitable to Land Application of Waste	N-A	NA	—	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	—	LTS	No mitigation needed; thus, none proposed.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Geo-9: Substantial Increase in Channel Erosion and Meander Migration	N-A	Long-term	–	N/A	No mitigation measures required.	N/A
	CP1– CP5	Long-term	–	LTS	Mitigation Measure Geo-9: Implement Channel Sensitive Water Release Schedules.	LTS
Impact Geo-10: Substantial Soil Erosion or Loss of Topsoil Due to Construction	N-A	NA	–	N/A	No mitigation measures required.	N/A
	CP1– CP3	Short-term	–	N/A	No mitigation needed; thus, none proposed.	N/A
Impact Geo-11: Alteration of Fluvial Geomorphology	CP4– CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	–	N/A	No mitigation measures required.	N/A
Impact Geo-12: Substantial Increase in Channel Erosion and Meander Migration (Lower Sacramento River and Delta)	CP1– CP3	Long-term	–	N/A	No mitigation needed; thus, none proposed.	N/A
	CP4– CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-13: Substantial Increase in Channel Erosion and Meander Migration (CVP/SWP Service Areas)	N-A	Long-term	–	N/A	No mitigation measures required.	N/A
	CP1– CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Air Quality and Climate						
Impact AQ-1: Short-Term Emissions of Criteria Air Pollutants and Precursors at Shasta Lake and Vicinity During Project Construction	N-A	NA	NA	N/A	No mitigation measures required.	N/A
	CP1– CP5	Short-term	NO _x emissions >137 lb/day, possible ROG & PM ₁₀ emissions >137 lb/day	S	Mitigation Measure AQ-1: Implement Standard Measures and Best Available Mitigation Measures to Reduce Emissions Levels.	SU

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact AQ-2: Long-Term Emissions of Criteria Air Pollutants and Precursors During Project Operation	N-A,	NA	NA	LTS	No mitigation measures required.	LTS
	CP1,	Long-term	Increase of an average of 148 one-way daily trips	LTS	No mitigation needed; thus none proposed.	LTS
	CP2	Long-term	Increase of an average of 251 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP4	Long-term	Increase of an average of 398 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5		Increase of an average of 711 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
Impact AQ-3: Exposure of Sensitive Receptors to Substantial Pollutant Concentrations	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact AQ-4: Exposure of Sensitive Receptors to Odor Emissions	CP1– CP5	Short-term and long-term	Exposure to CO, PM ₁₀ , PM _{2.5} , diesel PM	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact AQ-5: Short-Term Emissions of Criteria Air Pollutants and Precursors Below Shasta Dam During Project Construction	CP1– CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
CP4– CP5	Short-term	Would add an additional 1 lb/day of ROG, 16 lb/day of NO _x , & 1 lb/day of PM ₁₀ to construction	LTS	No mitigation needed; thus, none proposed.	LTS	

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact AQ-6: Generation of Greenhouse Gases	N-A CP1– CP5	NA Long-term	NA Reduction of GHGs	LTS B	No mitigation measures required. No mitigation needed; thus, none proposed.	LTS B
Hydrology, Hydraulics, and Water Management		Short-term	Emission of 14,043 to 18,311 metric tons CO ₂ e	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-1: Change in Frequency of Flows Above 100,000 cfs on the Sacramento River Below Bend Bridge	N-A CP1– CP5	NA Long-term	NA	NI	No mitigation measures required. No mitigation needed; thus, none proposed.	NI B
Impact H&H-2: Place Housing or Other Structures Within a 100-Year Flood Hazard Area as Mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or Other Flood Hazard Delineation Map	N-A CP1– CP5	NA	NA	NI	No mitigation measures required. No mitigation needed; thus, none proposed.	NI
Impact H&H-3: Place Within a 100-Year Flood Hazard Area Structures That Would Impede or Redirect Flood Flows	N-A CP1– CP5	NA	NA	NI	No mitigation measures required. No mitigation needed; thus, none proposed.	NI NI
Impact H&H-4: Change in Water Levels in the Old River near Tracy Road Bridge	N-A CP1– CP5	Long-term	Lower water levels	PS LTS	No mitigation measures required. No mitigation needed; thus, none proposed.	PS LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
H&H-5: Change in Water Levels in the Grant Line Canal near the Grant Line Canal Barrier	N-A	Long-term	Lower water levels	PS	No mitigation measures required.	PS
Impact H&H-6: Change in Water Levels in the Middle River near the Howard Road Bridge	N-A	Long-term	Lower water levels	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-7: Change in X2 Position	N-A	NA	NA	PS	No mitigation measures required.	PS
Impact H&H-8: Change in Recurrence of Delta Excess Conditions	N-A	Long-term	Reduced frequency	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-9: Change in Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	N-A	Long-term	Reduced frequency	PS	No mitigation measures required.	PS
Impact H&H-10: Change in Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	N-A	Long-term	Reduced frequency	PS	No mitigation measures required.	PS
Impact H&H-11: Change in Deliveries to SWP Table A, Contractors South of the Delta	N-A	Long-term	Reduced frequency	PS	No mitigation measures required.	PS
Impact H&H-12: Change in Groundwater	N-A	CP1-CP5 Short-term and long-term	Increased groundwater levels	B	No mitigation needed; thus, none proposed.	B

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact H&H-13: Change in Groundwater Quality	N-A	Short-term and long-term	–	LTS	No mitigation measures required.	LTS
	CP1– CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Water Quality						
Impact WQ-1: Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1– CP5	Temporary	–	PS	Mitigation Measure WQ-1: Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities.	LTS
Impact WQ-2: Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Temporary	Similar to CP1, but greater and longer duration (48-month construction period)	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Temporary	Similar to CP1, but greater and longer duration (60-month construction period)	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact WQ-3: Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-4: Long-Term Sediment Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	CP1– CP5	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-5: Long-Term Temperature Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	CP1– CP5	Long-term	–	PS	Mitigation Measure WQ-4: Implement Mitigation Measure WQ- 1: Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities.	LTS
Impact WQ-6: Long-Term Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-7: Long-Term Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	CP1	Long-term	5 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-8: Long-Term Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	CP2	Long-term	9 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-9: Long-Term Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	CP3– CP5	Long-term	13 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
WQ-6: Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	N/A	NA	NA	NI	No mitigation measures required.	NI
CP1–CP5	Long-term	–	PS	Mitigation Measure W/Q-6: Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines.	LTS	
CP1–CP3	Temporary	–	PS	Mitigation Measure W/Q-7 (CP1–CP3): Implement Mitigation Measure W/Q-1: Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities.	LTS	
Impact WQ-7: Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	CP4	Temporary	Similar to CP1–CP3, but greater	PS	Mitigation Measure W/Q-7 (CP4–CP5): Implement Mitigation Measure W/Q-1: Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities and Gravel Augmentation BMPs.	LTS
	CP5	Temporary	Similar to CP4, but greater	PS	Mitigation Measure W/Q-7 (CP4–CP5): Implement Mitigation Measure W/Q-1: Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities and Gravel Augmentation BMPs.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact WQ-8: Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-9: Temporary Construction-Related Metal Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-10: Long-Term Sediment Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	N-A	NA	NA	NI	No mitigation measures required.	NI

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Long-term	Reduce temperature exceedences at Bend Bridge by 4 percent under existing conditions and 5 percent under future conditions	B	No mitigation needed; thus, none proposed.	B
Impact WQ-11: Long-Term Temperature Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	CP2	Long-term	Reduce temperature exceedences at Bend Bridge by 6 percent under existing conditions and 8 percent under future conditions	B	No mitigation needed; thus, none proposed.	B
	CP3, CP5	Long-term	Reduce temperature exceedences at Bend Bridge by 8 percent under existing conditions and 11 percent under future conditions	B	No mitigation needed; thus, none proposed.	B
	CP4	Long-term	Reduce temperature exceedences at Bend Bridge by 13 percent under existing conditions and 15 percent under future conditions	B	No mitigation needed; thus, none proposed.	B
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-12: Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	CP1– CP5	Long-term	–	PS	Mitigation Measure WQ-12: Implement Mitigation Measure WQ-6: Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact WQ-13: Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-14: Temporary Construction-Related Temperature Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-15: Temporary Construction-Related Metal Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-16: Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	N-A	NA	NA	NI	No mitigation measures required.	NI

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact WQ-17: Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-18: Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	CP1– CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19a: Delta Salinity on the Sacramento River at Collinsville	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-19b: Delta Salinity on the San Joaquin River at Jersey Point	CP1– CP5	Long-term	<10% increases in salinity in extended study area (Collinsville)	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19c: Delta Salinity on the Sacramento River at Emmatton	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-19d: Delta Salinity on the Old River at Rock Slough	CP1– CP5	Long-term	No increase in electrical conductivity in extended study area (Jersey Point)	LTS	No mitigation needed; thus, none proposed.	LTS
				NI	No mitigation measures required.	NI
			No more than 0.2% increase in electrical conductivity in extended study area (Emmatton)	LTS	No mitigation needed; thus, none proposed.	LTS
			Chlorides not increased more than 1.2% in extended study area (Rock Slough)	LTS	No mitigation needed; thus, none proposed.	NI

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact WQ-19e: Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact WQ-19f: Delta Water Quality on the West Canal at the Mouth of the Clifton Court Forebay	N-A	Long-term	Electrical conductivity not changed, chlorides increased <1.0% in extended study area (Jones Pumping Plant)	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19g: Delta Salinity on the San Joaquin River at Vernalis	N-A	Long-term	Electrical conductivity not changed, chlorides increased <1.0% in extended study area (Clifton Court Forebay)	LTS	No mitigation measures required.	LTS
Impact WQ-19h: Delta Salinity on the San Joaquin River at Brandt Bridge	N-A	NA	NA	NI	No mitigation needed; thus, none proposed.	NI
Impact WQ-19i: Delta Salinity on the Old River near the Middle River	N-A	Long-term	No increase in electrical conductivity in extended study area (Brandt Bridge)	LTS	No mitigation measures required.	LTS
Impact WQ-19j: Delta Salinity on the Old River at Tracy Road Bridge	N-A	NA	NA	NI	No mitigation needed; thus, none proposed.	NI
Impact WQ-20: X2 Position	CP1-CP5	Long-term	No increase in number of months in which X2 is out of compliance in extended study area (Delta)	LTS	No mitigation measures required.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Noise and Vibration						
CP1– CP3	N-A	NA	NA	LTS	No mitigation measures required.	LTS
Impact Noise-1: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Construction Noise	CP4	Short-term	Blasting activities at the dam – noise levels of 60 dBA at sensitive receptors downstream on the Sacramento River (7,000 feet away) On-site heavy duty construction equipment at other project sites – exterior noise levels at noise-sensitive receptors located within 75 – 7,000 feet of construction activity could exceed applicable standards (>50 dBA L _{eq})	S	Mitigation Measure Noise-1: Implement Measures to Prevent Exposure of Sensitive Receptors to Temporary Construction Noise at Project Construction Sites.	LTS
CP5	Short-term	Similar to CP1–CP3, but greater noise related to gravel augmentation	–	S	Mitigation Measure Noise-1: Implement Measures to Prevent Exposure of Sensitive Receptors to Temporary Construction Noise at Project Construction Sites.	LTS
Impact Noise-2: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Vibration During Construction	CP1– CP5	Short-term	Similar to CP4, but greater noise related to restoration at Reading Island	S	Mitigation Measure Noise-1: Implement Measures to Prevent Exposure of Sensitive Receptors to Temporary Construction Noise at Project Construction Sites.	LTS
	N-A	NA	NA	LTS	No mitigation measures required.	LTS
	–	–	–	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Noise-3: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Mobile Source Noise During Operations	N-A	NA	NA	LTS	No mitigation measures required.	LTS
Hazards and Hazardous Materials and Waste						
Impact Hazz-1: Wildland Fire Risk (Shasta Lake and Vicinity and Upper Sacramento River)	CP1	Short-term	– (36-month construction period)	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer duration (48-month construction period)	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS
	CP3–CP5	Short-term	Similar to CP1 & CP2, but greater and longer duration (60-month construction period)	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Haz-2: Release Potentially Hazardous Materials or Hazardous Waste (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Short-term	(36-month construction period)	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer duration (48-month construction period)	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS
	CP3– CP5	Short-term	Similar to CP1 & CP2, but greater and longer duration (60-month construction period)	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Short-term	(36-month construction period)	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer duration (48-month construction period)	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Short-term	Similar to CP1 & CP2, but greater and longer duration (60-month construction period)	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1– CP5	Short-term (construction period)	–	PS	Mitigation Measure Haz-4: Reduce Potential for Exposure of Sensitive Receptors to Hazardous Materials or Waste.	LTS
Impact Haz-3: Expose Workers to Hazardous Materials (Shasta Lake and Vicinity and Upper Sacramento River)						
Impact Haz-4: Expose Sensitive Receptors to Hazardous Materials (Shasta Lake and Vicinity and Upper Sacramento River)						

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Haz-5: Wildland Fire Risk (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A CP1– CP5	NA Short-term	NA –	NI LTS	No mitigation measures required. No mitigation needed; thus, none proposed.	NI LTS
Impact Haz-6: Release Potentially Hazardous Materials or Hazardous Waste (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A CP1– CP5	NA Short-term	NA –	NI LTS	No mitigation measures required. No mitigation needed; thus, none proposed.	NI LTS
Impact Haz-7: Expose Workers to Hazardous Materials (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A CP1– CP5	NA Short-term	NA –	NI LTS	No mitigation measures required. No mitigation needed; thus, none proposed.	NI LTS
Impact Haz-8: Expose Sensitive Receptors to Hazardous Materials (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A CP1– CP5	NA Short-term	NA –	NI LTS	No mitigation measures required. No mitigation needed; thus, none proposed.	NI LTS
Agriculture and Important Farmlands						
Impact Ag-1: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Vicinity of Shasta Lake	N-A CP1– CP5	Permanent conversion NA	– –	PS NI	No mitigation measures required. No mitigation needed; thus, none proposed.	SU NI

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Ag-2: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Vicinity of Shasta Lake	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Permanent conversion	1,051 acres of forest land affected by inundation and 107 acres of forest land affected by infrastructure relocation	S	No feasible mitigation is available to reduce impact.	SU
	CP2	Permanent conversion	1,440 acres of forest land affected by inundation and 116 acres of forest land affected by infrastructure relocation	S	No feasible mitigation is available to reduce impact.	SU
	CP3–CP5	Permanent conversion	2,068 acres of forest land affected by inundation and 133 acres of forest land affected by infrastructure relocation	S	No feasible mitigation is available to reduce impact.	SU
	N-A	Permanent conversion	–	PS	No mitigation measures required.	SU
Impact Ag-3: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the Upper Sacramento River	CP1	NA	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	NA	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	NA	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Permanent conversion	NA	LTS	No mitigation measures required.	LTS
Impact Ag-4: Direct and Indirect Conversion of Forest Land to Nonforest Uses Along the Upper Sacramento River	CP1	Permanent conversion	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	NA	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	NA	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Ag-5: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Extended Study Area	N-A	Permanent conversion	–	PS	No mitigation measures required.	SU
Impact Ag-6: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Extended Study Area	CP1– CP5	NA	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Permanent conversion	NA	LTS	No mitigation measures required.	LTS
	CP1– CP5	Permanent conversion	–	LTS	No mitigation needed; thus, none proposed.	LTS
Fisheries and Aquatic Ecosystems						
Impact Aqua-1: Effects on Nearshore, Warm-Water Habitat in Shasta Lake from Project Operations	N-A	Permanent	–	PS	No mitigation measures required.	PS
Impact Aqua-2: Effects on Nearshore, Warm-Water Habitat in Shasta Lake from Project Construction	CP1– CP5	Permanent	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-3: Effects on Cold-Water Habitat in Shasta Lake	CP1– CP5	Temporary	NA	NI	No mitigation measures required.	NI
	N-A	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP1– CP5	Long-term	–	PS	No mitigation measures required.	PS
	CP1– CP5	Long-term	–	B	No mitigation needed; thus, none proposed.	B

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Aqua-4: Effects on Special-Status Aquatic Mollusks	N-A	Long-term	—	LTS	No mitigation measures required.	LTS
	CP1– CP5	Permanent		PS	Mitigation Measure Aqua-4: Geo-2: Replace Lost Ecological Functions of Aquatic Habitats by Restoring Existing Degraded Aquatic Habitats in the Vicinity of the Impact.	LTS
Impact Aqua-5: Effects on Special-Status Fish Species	N-A	—	—	LTS	No mitigation measures required.	LTS
	CP1– CP5	—	—	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-6: Creation or Removal of Barriers to Fish Between Tributaries and Shasta Lake	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1– CP5	Permanent	—	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-7: Effects on Spawning and Rearing Habitat of Adfluvial Salmonids in Low-Gradient Tributaries to Shasta Lake	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Permanent	5.4 miles of low-gradient reaches	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	7.4 miles of low-gradient reaches	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Permanent	11 miles of low-gradient reaches	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-8: Effects on Aquatic Connectivity in Non-Fish-Bearing Tributaries to Shasta Lake	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Permanent	12.6 miles of non-fish-bearing tributary habitat	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	17.3 miles of non-fish-bearing tributary habitat	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Permanent	24.0 miles of non-fish-bearing tributary habitat	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Aqua-9: Effects on Water Quality at Livingston Stone Hatchery	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact Aqua-10: Loss or Degradation of Aquatic Habitat in the Upper Sacramento River During Construction Activities	CP1–CP5	NA	NA	NI	No mitigation needed; thus, none proposed.	NI
Impact Aqua-11: Release and Exposure of Contaminants in the Upper Sacramento River During Construction Activities	CP1–CP5	Temporary, long-term, or both	–	LTS	No mitigation measures required.	NI
Impact Aqua-12: Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operation—Chinook Salmon	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	NI
	CP2	Long-term	Similar to CP1 & CP4, but greater in magnitude	B	No mitigation needed; thus, none proposed.	B
	CP3 & CP5	Long-term	Similar to CP1, CP2 & CP4, but greater in magnitude	B	No mitigation needed; thus, none proposed.	B

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Aqua-13: Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operations—Steelhead, Green Sturgeon, Sacramento Splittail, American Shad, and Striped Bass	N-A	NA	—	PS	No mitigation measures required.	PS
	CP1	Long-term	—	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4	Long-term	Similar to CP1–CP3 & CP5, but greater in magnitude	B	No mitigation needed; thus, none proposed.	B
Impact Aqua-14: Reduction in Ecologically Important Geomorphic Processes in the Upper Sacramento River Resulting from Reduced Frequency and Magnitude of Intermediate to High Flows	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	—	PS	Mitigation Measure Aqua-14: Implement Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Aqua-15: Changes in Flow and Water Temperatures in the Lower Sacramento River and Tributaries and Trinity River Resulting from Project Operation – Fish Species of Primary Management Concern	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	—	PS	Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Aqua-16: Reduction in Ecologically Important Geomorphic Processes in the Lower Sacramento River Resulting from Reduced Frequency and Magnitude of Intermediate to High Flows	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	–	PS	Mitigation Measure Aqua-16: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Aqua-17: Effects to Delta Fishery Habitat Resulting from Changes to Delta Outflow	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-18: Effects to Delta Fishery Habitat Resulting from Changes to Delta Inflow	CP2	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Aqua-19: Effects to Delta Fisheries Resulting from Changes in Sacramento River Inflow	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP2	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-20: Effects to Delta Fisheries Resulting from Changes in San Joaquin River Flow at Vernalis	CP2	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-21: Reduction in Low Salinity Habitat Conditions Resulting from an Upstream Shift in X2 Location	CP2	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Aqua-22: Increase in Mortality of Species of Primary Management Concern as a Result of Increased Reverse Flows in Old and Middle Rivers	N-A	NA	NA	NI	No mitigation measures required.	NI
CP1 & CP4	CP1 & CP4	Long-term	—	PS	No mitigation proposed.	PS
CP2	CP2	Long-term	—	PS	No mitigation proposed.	PS
CP3 & CP5	CP3 & CP5	Long-term	—	PS	No mitigation proposed.	PS
Impact Aqua-23: Increase in the Risk of Entrainment or Salvage of Species of Primary Management Concern at CVP and SWP Export Facilities Due to Changes in CVP and SWP Exports	N-A	NA	NA	NI	No mitigation measures required.	NI

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
CP1 & CP4	CP1 & CP4	Long-term	–	LTS for Chinook salmon, steelhead, and longfin smelt; PS for delta smelt, striped bass, and splittail	No mitigation proposed.	LTS
Impact Aqua-23: Increase in the Risk of Entrainment or Salvage of Species of Primary Management Concern at CVP and SWP Export Facilities Due to Changes in CVP and SWP Exports (contd.)	CP2	Long-term	–	LTS for Chinook salmon, steelhead, and longfin smelt; PS for delta smelt, striped bass, and splittail	No mitigation proposed.	LTS
CP3 & CP5	CP3 & CP5	Long-term	–	LTS for Chinook salmon, steelhead, and longfin smelt; PS for delta smelt, striped bass, and splittail	No mitigation proposed.	LTS
Impact Aqua-24: Impacts on Aquatic Habitats and Fish Populations in the CVP and SWP Service Areas Resulting from Modifications to Existing Flow Regimes	N/A	NA	NA	NI	No mitigation measures required.	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Botanical Resources and Wetlands						
Impact Bot-1: Loss of Federally or State Listed Plant Species	N/A	NA	NA	NI	No mitigation measures required.	NI
	CP1– CP5	NA	NA	NI	No mitigation needed; thus, none proposed.	NI
	N/A	Permanent	NA	NI	No mitigation measures required.	NI
	CP1	Permanent	–	S	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.	SU
Impact Bot-2: Loss of MSCS Covered Species	CP2	Permanent	Greater than CP1	S	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.	SU
	CP3– CP5	Permanent	Greater than CP1 & CP2	S	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.	SU

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N-A	Permanent	NA	NI	No mitigation measures required.	NI
CP1	Permanent	–		PS	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.	SU
Impact Bot-3: Loss of USFS Sensitive, BLM Sensitive, or CRPR Species	CP2	Permanent	Greater than CP1	PS	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.	SU
CP3– CP5	Permanent	Greater than CP1 & CP2		PS	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.	SU
	N-A	Permanent	NA	NI	No mitigation measures required.	NI
Impact Bot-4: Loss of Jurisdictional Waters	CP1	Permanent	–	S	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.	SU
	CP2	Permanent	Greater than CP1	S	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.	SU
CP3– CP5	Permanent	Greater than CP1 & CP2		S	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.	SU

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
	N-A	Permanent	NA	NI	No mitigation measure required.	NI
	CP1	Permanent	–	PS	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.	SU
Impact Bot-5: Loss of General Vegetation Habitats	CP2	Permanent	Greater than CP1	PS	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.	SU
	CP3– CP5	Permanent	Greater than CP1 & CP2	PS	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.	SU
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact Bot-6: Spread of Noxious and Invasive Weeds	CP1	Long-term and/or permanent	–	PS	Mitigation Measure Bot-6: Develop a Weed Management Plan.	LTS
	CP2	Long-term and/or permanent	Greater than CP1	PS	Mitigation Measure Bot-6: Develop a Weed Management Plan.	LTS
	CP3– CP5	Long-term and/or permanent	Greater than CP1 & CP2	PS	Mitigation Measure Bot-6: Develop a Weed Management Plan.	LTS
Impact Bot-7: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes	N-A	Long-term	NA	LTS	No mitigation measures required.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Bot-7: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes (contd.)	CP1 & CP4	Long-term	–	S	Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP2	Long-term	Greater than CP1 & CP4	S	Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	S	Mitigation Measure Bot-7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
N-A	Long-term	–	LTS	No mitigation measures required.	LTS	
CP1 & CP4	Long-term	–	PS	Mitigation Measure Bot-8: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	
CP2	Long-term	Greater than CP1 & CP4	PS	Mitigation Measure Bot-8: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	
CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	PS	Mitigation Measure Bot-8: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Bot-9: Disturbance or Removal of Designated Critical Habitat for Special-Status Species	N-A	Long-term and/or permanent	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Long-term and/or permanent	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term and/or permanent	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term and/or permanent	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Permanent	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Permanent	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Permanent	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Bot-11: Loss of Sensitive Natural Communities or Habitats Resulting from Implementing the Gravel Augmentation Program or the Reading Island Restoration Plan, Rehabilitating the Reading Island Boat Ramp, or Constructing a Handicap Fishing Access Area	N-A CP1– CP3	NA Long-term	NA –	NI NI	No mitigation measures required. No mitigation needed; thus, none proposed.	NI NI
Impact Bot-12: Loss of Special-Status Plants Resulting from Implementing the Gravel Augmentation Program, Restoring Sacramento River Flow Through Anderson Slough, Rehabilitating the Reading Island Boat Ramp, or Constructing a Handicap Fishing Access Area	N-A CP1– CP3	NA Long-term	NA –	PS NI	Mitigation Measure Bot-11: Revegetate Disturbed Areas, Consult with DFG.	LTS NI
Impact Bot-13: Spread of Noxious and Invasive Weeds Resulting from Implementing the Gravel Augmentation Program, Restoring Sacramento River Flow Through Anderson Slough, Rehabilitating the Reading Island Boat Ramp, or Constructing a Handicap Fishing Access Area	N-A CP1– CP3	NA Long-term	NA –	NI NI	Mitigation Measure Bot-12: Conduct Preconstruction Surveys for Special-Status Plants and Avoid Special-Status Plant Populations During Construction.	LTS NI

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
N-A	Long-term	–	LTS	No mitigation measures required.	LTS	
CP1 & CP4	Long-term	–	S for lower Sacramento River; LTS for Delta	Mitigation Measure Bot-14: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	
Impact Bot-14: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes on the Lower Sacramento River	CP2	Long-term	Greater than CP1 & CP4	S for lower Sacramento River; LTS for Delta	Mitigation Measure Bot-14: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	S for lower Sacramento River; LTS for Delta	Mitigation Measure Bot-14: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
	N-A	Long-term	–	PS	No mitigation measures required.	PS
CP1 & CP4	CP1 & CP4	Long-term	–	PS	Mitigation Measure Bot-15: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Bot-15: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management Along the Lower Sacramento River	CP2	Long-term	Greater than CP1 & CP4	PS	Mitigation Measure Bot-15: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	PS	Mitigation Measure Bot-15: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Bot-16: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth Along the Lower Sacramento River and in the Delta	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Bot-17: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes in the CVP/SWP Service Areas	CP2	Long-term	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Bot-18: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management in the CVP/SWP Service Areas	CP2	Long-term	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Bot-19: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas	N-A	Permanent	–	LTS	No mitigation measures required.	LTS
	CP1 & CP4	Permanent	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	Greater than CP1 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Permanent	Greater than CP1, CP2 & CP4	LTS	No mitigation needed; thus, none proposed.	LTS
	Wildlife Resources					
Impact Wild-1: Take and Loss of Habitat for the Shasta Salamander	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1	Short-term and long-term	–	S	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater	S	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.	SU
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater	S	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.	SU

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Wild-2: Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1	Short-term and permanent	52 acres	PS	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.	SU
	CP2	Short-term and permanent	64 acres	PS	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.	SU
	CP3–CP5	Short-term and permanent	96 acres	PS	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.	SU
	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1	Short-term and permanent	52 acres	PS	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.	SU
	CP2	Short-term and permanent	64 acres	PS	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.	SU
	CP3–CP5	Short-term and permanent	96 acres	PS	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.	SU
	Impact Wild-3: Impact on the Northwestern Pond Turtle and Its Habitat					

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Wild-4: Impact on the American Peregrine Falcon CP1–CP5	N-A	Long-term	Loss of nests –	NI	No mitigation measures required.	NI
		Short-term			Mitigation Measure Wild-4: Conduct Preconstruction Surveys for the American Peregrine Falcon and Establish Buffers.	LTS
	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1	Long-term	Inundation of nest trees, increase of prey habitat in primary study area	S	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.	SU
Impact Wild-5: Take and Loss of Habitat for the Bald Eagle	CP2	Long-term	Similar to CP1, but greater	S	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.	SU
	CP3–CP5	Long-term	Similar to CP1 & CP2, but greater	S	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.	SU

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Wild-6: Take and Loss of Nesting and Foraging Habitat for the Northern Spotted Owl	N-A	Long-term	–	NI	No mitigation measures required.	NI
CP1	Short-term and permanent	Loss of nests and habitat (3,116 acres)	PS	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Northern Spotted Owl and Establish Buffers.	SU	
CP2	Short-term and permanent	Loss of nests and habitat (3,429 acres)	PS	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Northern Spotted Owl and Establish Buffers.	SU	
CP3–CP5	Short-term and permanent	Loss of nests and habitat (3,909 acres)	PS	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Northern Spotted Owl and Establish Buffers.	SU	
N-A	Long-term	–	NI	No mitigation measures required.	NI	
CP1	Short-term and long-term	Loss of nests (10–11) and nest trees in primary study area	S	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for Purple Martin and Establish Buffers.	SU	
CP2	Short-term and long-term	Similar to CP1, but greater loss of nest trees	S	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for Purple Martin and Establish Buffers.	SU	
CP3–CP5	Short-term and long-term	Similar to CP1 & CP2, but greater loss of nest trees	S	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for Purple Martin and Establish Buffers.	SU	

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N-A	Long-term	–	NI	No mitigation measures required.	NI
CP1	Short-term and permanent	Loss of nests and habitat for Vaux's Swift (3,156 acres) and Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat (36 acres)	PS	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.	SU	
Impact Wild-8: Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat	CP2	Short-term and permanent	Loss of nests and habitat for Vaux's Swift (3,514 acres) and Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat (50 acres)	PS	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.	SU
	CP3–CP5	Short-term and permanent	Loss of nests and habitat for Vaux's Swift (3,978 acres) Willow Flycatcher, Yellow Warbler, and Yellow-Breasted Chat (69 acres)	PS	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.	SU

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
N-A	Long-term	—		NI	No mitigation measures required.	NI
CP1	Short-term and permanent	Loss of nests and 2,458 acres of Long-Eared Owl and Northern Goshawk habitat and 3,533 acres of Cooper's Hawk and Great Blue Heron habitat		PS	Mitigation Measure Wild-9: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron and Establish Buffers.	SU
Impact Wild-9: Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat	CP2	Short-term and permanent	Loss of nests and 2,958 acres of Long-Eared Owl and Northern Goshawk habitat and 3,956 acres of Cooper's Hawk and Great Blue Heron habitat	PS	Mitigation Measure Wild-9: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron and Establish Buffers.	SU
CP3– CP5	Short-term and permanent	Loss of nests and 3,444 acres of Long-Eared Owl and Northern Goshawk habitat and 4,603 acres of Cooper's Hawk and Great Blue Heron habitat		PS	Mitigation Measure Wild-9: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron and Establish Buffers.	SU

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
	N-A	Long-term	–	NI	No mitigation measures required.	NI
CP1	Short-term and permanent	Construction-related mortality and loss of habitat (2,498 acres)	PS	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.	SU	
Impact Wild-10: Take and Loss of Habitat for the Pacific Fisher	CP2	Short-term and permanent	Construction-related mortality and loss of habitat (2,778 acres)	PS	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.	SU
	CP3–CP5	Short-term and permanent	Construction-related mortality and loss of habitat (3,135 acres)	PS	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.	SU

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Wild-11: Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, and Yuma Myotis), the American Marten, and Ringtails and Their Habitat	N-A	Long-term	—	NI	No mitigation measures required.	NI
CP1	Short-term and permanent	Construction-related mortality and loss of habitat (6,550+ acres) in primary study area	PS	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.	SU	
CP2	Short-term and long-term	Construction-related mortality and loss of habitat (7,288+ acres)	PS	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.	SU	
CP3–CP5	Short-term and long-term	Construction-related mortality and loss of habitat (8,030+ acres)	PS	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.	SU	
N-A	Long-term	—	NI	No mitigation measures required.	NI	
Impact Wild-12: Impacts on Special-Status Terrestrial Mollusks (Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat	CP1	Short-term and permanent	Ground-disturbing activities, inundation of habitat	S	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.	SU
CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	S	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.	SU	
CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	S	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.	SU	

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
	N-A	Permanent	–	NI	No mitigation measures required.	NI
	CP1	Permanent	Inundation of habitat	PS	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.	SU
Impact Wild-13: Permanent Loss of General Wildlife Habitat	CP2	Permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.	SU
	CP3– CP5	Permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.	SU
	N-A	Short-term and long-term	–	NI	No mitigation measures required.	NI
	CP1	Short-term and long-term	–	PS	Mitigation Measure Wild-14: Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.	SU
Impact Wild-14: Impacts on Other Birds of Prey (Red- Tailed Hawk and Red- Shouldered Hawk) and Migratory Bird Species (American Robin, Anna's Hummingbird) and Their Foraging and Nesting Habitat	CP2	Short-term and long-term	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-14: Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.	SU
	CP3– CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-14: Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.	SU

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N-A	Short-term and long-term	–	NI	No mitigation measures required.	NI
Impact Wild-15: Loss of Critical Deer Winter and Fawning Range	CP1	Short-term and long-term	–	PS	Mitigation Measure Wild-15; Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-15; Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.	SU
	CP3– CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-15; Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.	SU
Impact Wild-16: Take and Loss of California Red-Legged Frog	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1– CP5	Long-term	[TBD]	[TBD]	[TBD]	[TBD]

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
N-A	Long-term	–	LTS	No mitigation measures required.	LTS	
CP1, CP4	Long-term	CP4 identical to CP1	PS	Mitigation Measure Wild-17: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	
Impact Wild-17: Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	PS	Mitigation Measure Wild-17: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
CP3- CP5	Long-term	CP3 & CP5 similar to CP1-CP2, but greater in magnitude;	PS	Mitigation Measure Wild-17: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Wild-18: Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
	CP1, CP4	Long-term	CP4 identical to CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Long-term	CP3 & CP5 similar to CP1–CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
	CP1, CP4	Long-term	CP4 identical to CP1	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Wild-19: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime	CP2	NA	CP2 similar to CP1 but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Long-term	CP3 & CP5 similar to CP1–CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
N-A	Long-term	–	LTS	No mitigation measures required.	LTS	
CP1, CP4	Long-term	CP4 identical to CP1	PS	Mitigation Measure Wild-20: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	
Impact Wild-20: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	PS	Mitigation Measure Wild-20: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
CP3– CP5	Long-term	CP3 & CP5 similar to CP1–CP2, but greater in magnitude	PS	Mitigation Measure Wild-20: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1– CP3	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Wild-21: Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program	CP4– CP5	Long-term	–	PS	Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Northwestern Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds. Avoid Removal or Degradation of Elderberry Shrubs and Avoid Vegetation Removal near Active Nest Sites.	LTS
	N-A	Long-term	–	NI	No mitigation measures required.	NI
	CP1– CP3	Long-term	–	NI	No mitigation measures required.	NI
Impact Wild-22: Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration of Reading Island	CP4– CP5	Long-term	–	PS	Mitigation Measure Wild-22: Implement Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Northwestern Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds. Avoid Removal or Degradation of Elderberry Shrubs and Avoid Vegetation Removal near Active Nest Sites.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
N-A	Long-term	–	LTS	No mitigation measures required.	LTS	
CP1, CP4	Long-term	CP4 identical to CP1	PS	Mitigation Measure Wild-23: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	
Impact Wild-23: Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	PS	Mitigation Measure Wild-23: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
CP3- CP5	Long-term	CP3 & CP5 similar to CP1-CP2, but greater in magnitude	PS	Mitigation Measure Wild-23: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS	

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Wild-24: Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes	N-A	Long-term	—	LTS	No mitigation measures required.	LTS
	CP1, CP4	Long-term	CP4 identical to CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Long-term	CP3 & CP5 similar to CP1-CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	Long-term	—	LTS	No mitigation measures required.	LTS
Impact Wild-25: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife Along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability	CP1, CP4	Long-term	CP4 identical to CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Long-term	CP3 & CP5 similar to CP1-CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
CP1, CP4	Long-term	CP4 identical to CP1		PS	Mitigation Measure Wild-26: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Wild-26: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat Along the Lower Sacramento River and in the Delta	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	PS	Mitigation Measure Wild-26: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
CP3- CP5	Long-term		CP3 & CP5 similar to CP1-CP2, but greater in magnitude	PS	Mitigation Measure Wild-26: 7: Develop and Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Wild-27: Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes	N-A	Long-term	—	LTS	No mitigation measures required.	LTS
CP1, CP4	CP1, CP4	Long-term	CP4 identical to CP1	LTS	No mitigation needed; thus, none proposed.	LTS
CP2	CP2	Long-term	CP2 similar to CP1 but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
CP3– CP5	CP3 & CP5 similar to CP1 and CP2, but greater	Long-term	CP3 & CP5 similar to CP1 and CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Cultural Resources						
Impact Culture-1: Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation	N-A	Long-term	—	NI	No mitigation measures required.	NI
CP1	CP1	Long-term	355 localities potentially containing historic-era remains within inundation area	S	Mitigation Measure Culture-1: Comply with Section 106 of the NHPA.	LTS
CP2	CP2	Long-term	371 localities potentially containing historic-era remains within inundation area	S	Mitigation Measure Culture-1: Comply with Section 106 of the NHPA.	LTS
CP3– CP5	CP3– CP5	Long-term	391 localities potentially containing historic-era remains within inundation area	S	Mitigation Measure Culture-1: Comply with Section 106 of the NHPA.	LTS
Impact Culture-2: Inundation of Traditional Cultural Properties and Sacred Sites	N-A	Long-term	—	NI	No mitigation measures required.	NI
CP1– CP5	CP1– CP5	Long-term	—	SU	No feasible mitigation available to reduce impact.	SU
CP1– CP3	CP1– CP3	Long-term	—	NI	No mitigation measures required.	NI
CP4– CP5	CP4– CP5	Long-term	—	NI	No mitigation needed; thus, none proposed.	NI
Impact Culture-3: Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction				S	Mitigation Measure Culture-3: Implement Mitigation Measure Culture-1; Comply with Section 106 of the NHPA.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Indian Trust Assets						
No impacts to ITAs were identified						
Socioeconomics, Population, and Housing						
Impact Socio-1 (No-Action): Potential for Reduced Employment Opportunities for Lower Sacramento River and Delta Area Residents	N-A	Temporary	Potential periodic water and power supply disruptions	PS	No mitigation measures required.	PS
Impact Socio-1 (CP1-CP5) Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities	CP1-CP5	Short-term	—	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Socio-2 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the Lower Sacramento River and Delta Area	N-A	Temporary	Potential periodic water or power supply disruptions	PS	No mitigation measures required.	PS
Impact Socio-2 (CP1-CP5): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities	CP1-CP5	Short-term	450 new construction jobs, 580 new indirect jobs, and 790 induced jobs	B	No mitigation needed; thus, none proposed.	B
	CP2	Temporary	370 new direct construction jobs, 480 new indirect jobs, and 650 induced jobs	B	No mitigation needed; thus, none proposed.	B
	CP3-CP4	Short-term	350 new direct construction jobs, 450 new indirect jobs, and 610 induced jobs	B	No mitigation needed; thus, none proposed.	B
	CP5	Short-term	350 new direct construction jobs, 450 new indirect jobs, and 620 induced jobs	B	No mitigation needed; thus, none proposed.	B

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Socio-3 (No-Action): Potential for Reduced Employment Opportunities for Residents Within the CVP and SWP Service Areas	N-A	Temporary	Potential water or power supply disruptions	PS	No mitigation measures required.	PS
Impact Socio-3 (CP1-CP5): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment	CP1- CP5	Temporary	—	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Socio-4 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the CVP and SWP Service Areas	N-A	Temporary	Potential water or power supply disruptions	PS	No mitigation measures required.	PS
Impact Socio-4 (CP1-CP5): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities	CP1 CP2 CP3 CP4 CP5	Short-term	\$183.5 million in personal annual incomes in the local economic study area \$152 million in personal annual incomes \$141.6 million in personal annual incomes \$142.4 million in personal annual incomes \$142.9 million in personal annual incomes	B B B B B	No mitigation needed; thus, none proposed. No mitigation needed; thus, none proposed.	B B B B B

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Socio-5: Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry	N-A	Short-term	NA	NA	No mitigation measures required.	NA
	CP1	Short-term	– (36-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial (48-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Short-term	Similar to CP1 & CP2, but more beneficial (60-month construction period)	B	No mitigation needed; thus, none proposed.	B
	N-A	Short-term	NA	NA	No mitigation measures required.	NA
Impact Socio-6: Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases	CP1	Short-term	\$550.7 million in total personal income, with almost \$378.4 million in direct income and approximately \$172.3 million in indirect and induced income during the construction period	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Short-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
	N-A	Long-term	NA	NA	No mitigation measures required.	NA
Impact Socio-7: Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area	CP1	Long-term	–	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Long-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
	N-A	Long-term	NA	NA	No mitigation measures required.	NA
Impact Socio-8: Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations	CP1– CP5	Long-term	Two or more new maintenance-related positions for the Shasta Dam facilities	B	No mitigation needed; thus, none proposed.	B

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Socio-9: Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta	N-A	Temporary	NA	NA	No mitigation measures required.	NA
	CP1	Temporary	–	B	No mitigation needed; thus, none proposed.	B
	CP2	Temporary	Similar to CP1, but more beneficial than CP1	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Temporary	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
	N-A	Short-term	NA	NA	No mitigation measures required.	NA
Impact Socio-10: Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area That Support the Construction Industry	CP1	Short-term	– (36-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial (48-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Short-term	Similar to CP1 & CP2, but more beneficial (60-month construction period)	B	No mitigation needed; thus, none proposed.	B
	N-A	Short-term	NA	NA	No mitigation measures required.	NA
Impact Socio-11: Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases	CP1	Short-term	–	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial (48-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Short-term	Similar to CP1 & CP2, but more beneficial (60-month construction period)	B	No mitigation needed; thus, none proposed.	B

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Socio-12: Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area	N-A	Long-term	NA	NA	No mitigation measures required.	NA
	CP1	Long-term	–	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Similar to CP1, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Long-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	N-A	Short-term	NA	NA	No mitigation measures required.	NA
Impact Socio-13: Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas That Support the Construction Industry	CP1	Short-term	– (36-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial (48-month construction period)	B	No mitigation needed; thus, none proposed.	B
	CP3– CP5	Short-term	Similar to CP1 & CP2, but more beneficial (60-month construction period)	B	No mitigation needed; thus, none proposed.	B
	N-A	Temporary	NA	NA	No mitigation measures required.	NA
Impact Socio-14: Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas During Construction	CP1– CP2	Temporary	–	PS	Mitigation Measure Socio-14: Secure Replacement Water or Hydropower During Project Construction.	LTS
	CP3– CP5	Temporary	–	PS	Mitigation Measure Socio-14: Secure Replacement Water or Hydropower During Project Construction.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Socio-15: Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases	N-A CP1 CP2 CP3– CP5	Short-term Temporary Temporary Temporary	NA – Similar to CP1, but more beneficial (48-month construction period) Similar to CP1 & CP2, but more beneficial (60-month construction period)	NA B B	No mitigation measures required. No mitigation needed; thus, none proposed. No mitigation needed; thus, none proposed.	NA B
Impact Socio-16: Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability	N-A CP1 CP2 CP3– CP5	Long-term Long-term Long-term	– Similar to CP1, but more beneficial Similar to CP1 & CP2, but more beneficial	NA B B	No mitigation measures required. No mitigation needed; thus, none proposed. No mitigation needed; thus, none proposed.	NA B
Impact Socio-17: Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability	N-A CP1– CP2 CP3– CP5	Long-term Long-term Long-term	NA – –	NA B B	No mitigation measures required. No mitigation needed; thus, none proposed. No mitigation needed; thus, none proposed.	NA B

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Land Use Planning						
Impact LU-1: Disrupt Existing Land Uses (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Short-term and long-term	–	PS	Mitigation Measure LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.	SU
	CP2	Short-term and long-term	Similar to CP1 but greater	PS	Mitigation Measure LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2 but greater	PS	Mitigation Measure LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.	SU
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact LU-2: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Shasta Lake and Vicinity and Upper Sacramento River)	CP1	Short-term and long-term	–	PS	Mitigation Measure LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.	SU
	CP2	Short-term and long-term	Similar to CP1 but greater	PS	Mitigation Measure LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2 but greater	PS	Mitigation Measure LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.	SU
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact LU-3: Disrupt Existing Land Uses (Lower Sacramento River, Delta, CVP/SWP Service Areas)	CP1–CP3	Short-term and long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact LU-4: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1– CP3	Short-term and long- term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4– CP5	Short-term and long- term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Recreation and Public Access						
Impact Rec-1 (No-Action): Increased Use of Shasta Lake Recreation Facilities and Demand for Recreation Opportunities on Shasta Lake and in the Vicinity	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
Impact Rec-1 (CP1–CP5): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation	CP1	Permanent	99 facilities and infrastructure elements	LTS	Mitigation Measure Rec-1: Modify and Relocate Recreation Facilities Inundated by Increases in Shasta Lake Full Pool Elevation.	LTS
	CP2	Permanent	122 facilities and infrastructure elements	LTS	Mitigation Measure Rec-1: Modify and Relocate Recreation Facilities Inundated by Increases in Shasta Lake Full Pool Elevation.	LTS
	CP3– CP5	Permanent	163 facilities and infrastructure elements	LTS	Mitigation Measure Rec-1: Modify and Relocate Recreation Facilities Inundated by Increases in Shasta Lake Full Pool Elevation.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Rec-2 (No-Action): Increased Use and Demand for Recreation Opportunities on the Upper Sacramento River	N-A	Long-term	–	LTS	No mitigation measure required.	LTS
Impact Rec-2 (CP1– CP5): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam	CP1	Short-term	(36-month construction period)	PS	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.	LTS
	CP2	Short-term	Similar to CP1, but greater duration (48-month construction period)	PS	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.	LTS
	CP3 CP5	Short-term	Similar to CP1 & CP2, but greater duration (60-month construction period)	PS	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Rec-3 (No-Action): Increased Use and Demand for Recreation Opportunities on the Lower Sacramento River and in the Delta	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
Impact Rec-3 (CP1–CP5): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir	CP1	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-4 (No-Action): Increased Use and Demand for Recreation Opportunities in the CVP and SWP Service Areas	N-A	Long-term	–	LTS	No mitigation measures required.	LTS
Impact Rec-4 (CP1–CP5): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone	CP1 & CP4	Long-term	–	S	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.	LTS
	CP2	Long-term	Similar to CP1, but greater	S	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater	S	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Rec-5 (CP1–CP5): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact Rec-6 (CP1–CP5): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-7 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows	CP2	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Rec-8 (CP1–CP5): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Long-term	–	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Similar to CP1, but greater	B	No mitigation needed; thus, none proposed.	B
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater	B	No mitigation needed; thus, none proposed.	B
	CP4	Long-term	Similar to CP1–CP3 & CP5, but greater	B	No mitigation needed; thus, none proposed.	B
	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact Rec-9 (CP1–CP5): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-10 (CP1–CP5): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program	CP1–CP3	Short-term	–	NI	No mitigation measures required.	NI
	CP4–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Rec-11 (CP1–CP5): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Reading Island	N-A CP1– CP3	NA Long-term	NA –	NI NI	No mitigation measures required. No mitigation needed; thus, none proposed.	NI NI
	CP4– CP5	Long-term	–	B	No mitigation needed; thus, none proposed.	B
	N-A CP1 & CP4	NA Long-term	NA –	NI LTS	No mitigation measures required. No mitigation needed; thus, none proposed.	NI LTS
Impact Rec-12 (CP1–CP5): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	CP2 CP3 & CP5	Long-term	Similar to CP1, but greater Similar to CP1 & CP2, but greater	LTS LTS	No mitigation needed; thus, none proposed. No mitigation needed; thus, none proposed.	LTS LTS
	N-A CP1 & CP4	NA Long-term	NA –	NI LTS	No mitigation needed; thus, none proposed.	NI LTS
Impact Rec-13 (CP1–CP5): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	CP2 CP3 & CP5	Long-term	Similar to CP1, but greater Similar to CP1 & CP2, but greater	LTS LTS	No mitigation needed; thus, none proposed. No mitigation needed; thus, none proposed.	LTS LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Rec-14 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	N/A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	N/A	NA	NA	NI	No mitigation measures required.	NI
	CP1 & CP4	Long-term	–	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqu-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS
	CP2	Long-term	Similar to but potentially greater than CP1	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqu-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS
	CP3 & CP5	Long-term	Similar to but potentially greater than CP1 & CP2	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqu-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Aesthetics and Visual Resources						
Impact Vis-1: Consistency with Guidelines for Visual Resources in the STNF LRMP (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	Short-term and long-term	NA	NI	No mitigation measures required.	NI
	CP1–CP5	Short-term and long-term	Degraded visual character and quality of primary study area	SU	No feasible mitigation is available to reduce impact.	SU
	N-A	Short-term	NA	NI	No mitigation measures required.	NI
	CP1	Short-term	Scenic views obstructed or degraded in primary study area	SU	No feasible mitigation available to reduce impact.	SU
	CP2	Short-term	Similar to CP1, but greater (acres, miles, duration)	SU	No feasible mitigation available to reduce impact.	SU
	CP3–CP5	Short-term	Similar to CP1 & CP2, but greater (acres, miles, duration)	SU	No feasible mitigation available to reduce impact.	SU
	N-A	Short-term and long-term	NA	NI	No mitigation measures required.	NI
Impact Vis-2: Degradation and/or Obstruction of a Scenic View from Key Observation Points (Shasta Lake and Vicinity and Upper Sacramento River)						
	CP1	Short-term	Increased glare in primary study area	S	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater (amount, duration)	S	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (amount, duration)	S	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.	SU
Impact Vis-3: Generation of Increased Daytime Glare and/or Nighttime Lighting (Shasta Lake and Vicinity and Upper Sacramento River)						

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Vis-4: Consistency with Federal and State Scenic Highway Requirements (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	Permanent	NA	NI	No mitigation measures required.	NI
	CP1	Permanent	Visible from SR 151.	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	Similar to CP1, but greater vegetation removal would be visible	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Permanent	Similar to CP1 & CP2, but greater vegetation removal would be visible	LTS	No mitigation needed; thus, none proposed.	LTS
Transportation and Traffic						
Impact Trans-1: Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	N-A	NA	NA	LTS	No mitigation measures required.	LTS
	CP1	Long-term	Increase of 148 one-way trips per day throughout the primary study area	LTS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	CP2	Short-term	Approximately 83 round trips per day by haul trucks and 900 round trips per day (36-month construction period)	PS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
		Long-term	Increase of 251 one-way trips per day throughout the primary study area	LTS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
Impact Trans-1: Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	CP3– CP5	Short-term	Similar to CP1, but over a longer period (48-month construction period)	PS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
		Long-term	Increase of 398 one-way trips per day throughout the primary study area	LTS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
		Short-term	Similar to CP1 & CP2, but over a longer period (60-month construction period)	PS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Trans-2: Adverse Effects on Access to Local Streets or Adjacent Uses in the Primary Study Area	N-A	NA	NA	LTS	No mitigation measures required.	LTS
CP1	Permanent and/or temporary	Road closures and detours or partial road closures, or a combination of both, at Shasta Lake	PS	Mitigation Measure Trans-2: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	Mitigation Measure Trans-2: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
CP2	Permanent and/or temporary	Similar to CP1, but over a longer period	PS	Mitigation Measure Trans-2: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	Mitigation Measure Trans-2: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
CP3–CP5	Permanent and/or temporary	Similar to CP1 and CP2, but over a longer period	PS	Mitigation Measure Trans-2: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	Mitigation Measure Trans-2: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	N-A	NA	NA	LTS	No mitigation measures required.	LTS
Impact Trans-3: Hazards in the Primary Study Area Caused by a Design Feature	CP1	Permanent	Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards	B	No mitigation needed; thus, none proposed.	B
CP2	Permanent	Similar to CP1, but more road segments and bridges would be replaced	B	No mitigation needed; thus, none proposed.	No mitigation needed; thus, none proposed.	B
CP3–CP5	Permanent	Similar to CP1 and CP2, but more road segments & bridges would be replaced	B	No mitigation needed; thus, none proposed.	No mitigation needed; thus, none proposed.	B

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
	N/A	NA	NA	LTS	No mitigation measures required.	LTS
CP1	Temporary	— (36-month construction period)		PS	Mitigation Measure Trans-4: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
CP2	Temporary	Similar to CP1, but for a longer period (48-month construction period)		PS	Mitigation Measure Trans-4: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
Impact Trans-4: Adverse Effects on Emergency Access in the Primary Study Area	CP3	Temporary	Similar to CP1 & CP2, but for a longer period (60-month construction period)	PS	Mitigation Measure Trans-4: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
CP4– CP5	Temporary	Similar to CP3, but with gravel augmentation		PS	Mitigation Measure Trans-4: Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	N/A	NA	NA	LTS	No mitigation measures required.	LTS
CP1	Permanent	— (36-month construction period)		PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS
Impact Trans-5: Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area	CP2	Permanent	Similar to CP1, but greater (48-month construction period)	PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS
CP3– CP5	Permanent	Similar to CP1 & CP2, but greater. (60-month construction period)		PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Trans-6 (No-Action): Temporary Increase in Traffic in the Extended Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	N-A	Temporary	—	LTS	No mitigation measures required.	LTS
Impact Trans-7 (No-Action): Adverse Effects on Access to Local Streets or Adjacent Uses in the Extended Study Area	N-A	Temporary	NA	NA	No mitigation needed; thus, none proposed.	NA
Impact Trans-8 (No-Action): Hazards in the Extended Study Area Caused by a Design Feature	N-A	Temporary	—	LTS	No mitigation measures required.	LTS
Impact Trans-9 (No-Action): Adverse Effects on Emergency Access in the Extended Study Area	N-A	Temporary	—	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Trans-10 (No-Action): Accelerated Degradation of Surface Transportation Facilities in the Extended Study Area	N-A	Temporary	—	LTS	No mitigation measures required.	LTS
	CP1– CP5	Temporary	NA	NA	No mitigation needed; thus, none proposed.	NA

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Utilities and Service Systems						
Impact Util-1: Damage or Disruption of Public Utility and Service Systems (Shasta Lake and Vicinity and Upper Sacramento River)	CP1	Short-term	NA	NI	No mitigation measures required.	NI
	CP2	Short-term	Abandon & relocate 31,000 feet of power lines, 35,000 feet of telecommunications lines (36-month construction period)	PS	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.	LTS
	CP3-CP5	Short-term	Abandon & relocate 36,000 feet of power lines, 37,000 feet of telecommunications lines (48-month construction period)	PS	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.	LTS
	CP1	Short-term	Abandon & relocate 38,500 feet of power lines, 40,000 feet of telecommunications lines (60-month construction period)	PS	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.	LTS
Impact Util-2: Utility Infrastructure Relocation or Modification (Shasta Lake and Vicinity and Upper Sacramento River)	CP2	Short-term	NA	NI	No mitigation measures required.	NI
	CP3-CP5	Short-term	Abandon & relocate 31,000 feet of power lines, 35,000 feet of telecommunications lines (36-month construction period)	PS	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.	LTS
	CP2	Short-term	Abandon & relocate 36,000 feet of power lines, 37,000 feet of telecommunications lines (48-month construction period)	PS	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.	LTS
	CP3-CP5	Short-term	Abandon & relocate 38,500 feet of power lines, 40,000 feet of telecommunications lines (60-month construction period)	PS	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.	LTS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Util-3: Short-Term Increase in Solid Waste Generation (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Short-term	176,627 cubic yards of solid waste	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	188,584 cubic yards of solid waste	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Short-term	194,195 cubic yards of solid waste	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Util-4: Increases in Solid Waste Generation from Increased Recreational Opportunities (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	Similar to CP1 but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3– CP5	Short-term	Similar to but greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Util-5: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1– CP5	Long-term	–	NA(RS)	No mitigation needed; thus, none proposed.	NA(RS)
Impact Util-6: Damage or Disruption of Public Utility and Service Systems Infrastructure (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	NA	NA	No mitigation measures required.	NA
	CP1– CP3	Short-term	NA	NI	No mitigation needed; thus, none proposed.	NI
	CP4– CP5	Short-term	–	LTS	No mitigation measures required.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact Util-7: Utility Infrastructure Relocation or Modification (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	NA	NA	No mitigation measures required.	NA
Impact Util-8: Short-Term Increase in Solid Waste Generation (Lower Sacramento River, Delta, CVP/SWP Service Areas)	CP1– CP5	Short-term	NA	NI	No mitigation needed; thus, none proposed.	NI
Impact Util-9: Increases in Solid Waste Generation from Increased Recreational Opportunities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	CP1– CP3	Short-term	NA	NA	No mitigation measures required.	NA
Impact Util-10: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Lower Sacramento River, Delta, CVP/SWP Service Areas)	CP4– CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP1– CP5	Long-term	NA	NA	No mitigation measures required.	NA
	CP1– CP5	Long-term	NA	NA	No mitigation measures required.	NA
	CP1– CP5	Long-term	NA	NA(RS)	No mitigation needed; thus, none proposed.	NA(RS)

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Public Services						
Impact PS-1: Disruption of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	N/A	NA	NA	NI	No mitigation measures required.	NI
CP1	Short-term	(36-month construction period)		PS	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.	LTS
CP2	Short-term	Similar to CP1, but greater duration & area (48-month construction period)		PS	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.	LTS
CP3–CP5	Short-term	Similar to CP1 & CP2, but greater duration & area (60-month construction period)		PS	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.	LTS
Impact PS-2: Degraded Level of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	N/A	NA	NA	NI	No mitigation measures required.	NI
CP1	Short-term	– (36-month construction period)		PS	PS-2: Provide Support to Public Services Agencies.	LTS
CP2	Short-term	Similar to CP1, but greater duration (48-month construction period)		PS	PS-2: Provide Support to Public Services Agencies.	LTS
CP3–CP5	Short-term	Similar to CP1 & CP2, but greater duration (60-month construction period)		PS	PS-2: Provide Support to Public Services Agencies.	LTS
Impact PS-3: Relocation of Public Service Facilities (Shasta Lake and Vicinity and Upper Sacramento River)	N/A	NA	No impact	NI	No mitigation measures required.	NI
CP1	Long-term	–		LTS	No mitigation needed; thus, none proposed.	LTS
CP2	Long-term	Greater than CP1		LTS	No mitigation needed; thus, none proposed.	LTS
CP3–CP5	Long-term	Greater than CP1 & CP2		LTS	No mitigation needed; thus, none proposed.	LTS

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact PS-4: Short-Term Disruption of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	No impact	NI	No mitigation measures required.	NI
	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
Impact PS-5: Degraded Levels of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	CP4–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	No impact	NI	No mitigation measures required.	NI
Impact PS-6: Relocation of Public Services Facilities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	N-A	NA	No impact	NI	No mitigation measures required.	NI
Power and Energy	CP1–CP5	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Hydro-1: Decrease in Shasta Powerplant Energy Generation	N-A, CP1–CP5	Long-term	>5% decrease in long-term monthly average hydropower generation in primary study area at a level of recurrence that would substantially affect the power market	PS	No feasible mitigation proposed to reduce impact.	PS
Impact Hydro-2: Decrease in CVP and SWP Powerplant Energy Generation	N-A, CP1–CP5	Long-term	>5% decrease in long-term monthly average hydropower generation in CVP and SWP service areas at a level of recurrence that would substantially affect the power market	PS	No feasible mitigation proposed to reduce impact.	PS
Impact Hydro-3: Increase in CVP and SWP Pumping Plant Energy	N-A, CP1–CP5	Long-term	>5% increase in long-term monthly average power consumption in CVP and SWP service areas at a level of recurrence that would substantially affect the power market	PS	No feasible mitigation proposed to reduce impact.	PS

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt¹	Impact Duration²	Quantification/ Relative Magnitude of Impact³	LOS Before Mitigation⁴	Mitigation Measure	LOS After Mitigation⁴
Impact Hydro-4: Decrease in CVP and SWP Net Energy Generation	N-A, CP1–CP5	Long-term	>5% decrease in long-term monthly average net energy generation in CVP and SWP Service Areas at a level of recurrence that would substantially affect the power market.	PS	No feasible mitigation proposed to reduce impact.	PS
Impact Hydro-5: Decrease in Pit 7 Powerplant Net Energy Generation	N-A	NA	NA	NI	No mitigation measures required.	NI
Impact CP1	CP1	Long-term	<5% decrease in net energy generation in Pit 7 Powerplant	LTS	No mitigation needed; thus, none proposed.	LTS
Impact CP2–CP5	CP2–CP5	Long-term	>5% decrease in net energy generation in Pit 7 Powerplant	PS	No feasible mitigation proposed to reduce impact.	PS
Environmental Justice						
Impact EJ-1: Potential Disproportionate Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake	N-A	NA	NA	NDHA	No mitigation measures required.	NDHA
Impact EJ-2: Potential Disproportionate Effect on Native American Populations in the Vicinity of Shasta Lake	CP1–CP5	Short-term	–	NDHA	No mitigation needed; thus, none proposed.	NDHA
Impact EJ-3: Potential Disproportionate Effect on Minority and Low-Income Populations in the Upper Sacramento River Area	CP1–CP5	Short-term and long-term	–	DHA	No mitigation measures required.	DHA
	N-A	Long-term	NA	NDHA	No feasible mitigation available to reduce impact.	NDHA
	CP1–CP5	Long-term	–	NDHA	No mitigation measures required.	NDHA
				NDHA	No mitigation needed; thus, none proposed.	NDHA

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact EJ-4: Potential Disproportionate Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area	N-A	NA	NA	NDHA	No mitigation measures required.	NDHA
Impact EJ-5: Potential Disproportionate Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas	N-A	NA	NA	NDHA	No mitigation needed; thus, none proposed.	NDHA
Wild and Scenic River Considerations for McCloud River						
Impact WASR-1: McCloud River's Eligibility for Listing as a Federal Wild and Scenic River	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Long-term	18 percent of Segment 4 would be periodically inundated	SU	No feasible mitigation available to reduce impact.	SU
	CP2	Long-term	21 percent of Segment 4 would be periodically inundated	SU	No feasible mitigation available to reduce impact.	SU
	CP3-CP5	Long-term	39 percent increase over the current transition reach), inundating larger portion of the lower McCloud River and Segment 4	SU	No feasible mitigation available to reduce impact.	SU
Impact WASR-2: Conflict with STNF LRMP or CRMP	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1-CP5	Long-term	Increased inundation would conflict with the STNF Land and Resource Management Plan and CRMP	SU	No feasible mitigation available to reduce impact.	SU

Table S-1. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt ¹	Impact Duration ²	Quantification/ Relative Magnitude of Impact ³	LOS Before Mitigation ⁴	Mitigation Measure	LOS After Mitigation ⁴
Impact WASR-3: Conflict with the California Public Resources Code, Section 5093.542	N-A	NA	NA	NI	No mitigation measures required.	NI
	CP1	Long-term	Would affect about 2 percent of the lower McCloud River	SU	No feasible mitigation available to reduce impact.	SU
	CP2	Long-term	Would affect about 2.3 percent of the lower McCloud River	SU	No feasible mitigation available to reduce impact.	SU
	CP3– CP5	Long-term	Would affect about 3 percent of the lower McCloud River	SU	No feasible mitigation available to reduce impact.	SU

Notes:

¹ Alt = alternative. N-A = No-Action Alternative. CP = Comprehensive Plan.² NA = not applicable. Short-term = construction-related or otherwise persisting from one to several years. Long-term = persisting for years to decades. Permanent = persisting at least years to decades and effectively irreversible.³ NA = not applicable. “_” = the least impact among the action alternatives or an impact that is comparable in type and magnitude to the least impact among the alternatives.⁴ LOS = level of significance. B = beneficial. NA = not applicable. NI = no impact. LTS = less than significant. PS = potentially significant. S = significant. SU = significant and unavoidable. NDHA = not disproportionately high and adverse. DHA = disproportionately high and adverse. R/S = remote and speculative.

Key:

BLM = U.S. Bureau of Land Management

BMP = best management practice

cfs = cubic feet per second

CO = carbon monoxide

CO₂e = carbon dioxide equivalent

CP = Comprehensive Plan

CRMP = Coordinated Resources Management Plan

CRPR = California Rare Plant Rank

CVP = Central Valley Project

dBa = A-weighted decibels

Delta = Sacramento–San Joaquin Delta

DFG = California Department of Fish and Game

GHG = greenhouse gas

ITA = Indian Trust Assets

lb = pound

L_{eq} = equivalent noise level

LRMP = land and resource management plan
 MSCS = Multi-Species Conservation Strategy
 NHPA = National Historic Preservation Act
 NO_x = oxides of nitrogen
 PM = particulate matter
 PM₁₀ = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
 PM_{2.5} = respirable particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
 ROG = reactive organic gas
 SR = State Route
 STNF = Shasta-Trinity National Forest
 SWP = State Water Project
 TBD = to be determined
 USFS = U.S. Forest Service

X2 = distance in kilometers from the Golden Gate Bridge to the location where salinity concentration is 2 parts per thousand

Shasta Lake Water Resources Investigation
Environmental Impact Statement

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Contents

Chapter 1 Introduction.....	1-1
1.1 Background	1-1
1.1.1 SLWRI Authorization.....	1-2
1.1.2 Major Previous Studies and Reports	1-3
1.2 Purpose and Need for Proposed Action and Project Objectives	1-3
1.2.1 Purpose and Need for Proposed Action	1-3
1.2.2 Project Objectives	1-8
1.3 Setting and Location	1-9
1.3.1 Primary Study Area.....	1-11
1.3.2 Extended Study Area	1-14
1.4 NEPA Requirements	1-18
1.4.1 NEPA Process	1-18
1.5 Intended Use of EIS	1-18
1.5.1 Intended Use of Preliminary Draft EIS	1-18
1.5.2 Intended Use of Final EIS.....	1-19
1.6 Areas of Controversy/Issues to Be Resolved.....	1-21
1.6.1 Areas of Controversy	1-21
1.6.2 Issues to Be Resolved	1-24
1.7 Documents Used to Prepare Preliminary Draft EIS	1-26
1.7.1 CVPIA EIS.....	1-26
1.7.2 CALFED EIS/EIR	1-27
1.8 Organization of Preliminary Draft EIS	1-27
Chapter 2 Alternatives.....	2-1
2.1 Alternatives Development Process	2-1
2.1.1 Plan Formulation Process	2-2
2.1.2 Project Objectives	2-4
2.1.3 Management Measures	2-5
2.1.4 Initial Alternatives Phase	2-10
2.1.5 Development and Refinement of Comprehensive Plans	2-12
2.2 Alternatives Considered and Eliminated from Further Analysis.....	2-15
2.2.1 Initial Alternatives Phase	2-15
2.2.2 Comprehensive Plans Phase	2-19
2.3 No-Action Alternative	2-20
2.3.1 Anadromous Fish Survival	2-21
2.3.2 Water Supply Reliability	2-22

Shasta Lake Water Resources Investigation
Environmental Impact Statement

2.3.3	Ecosystem Resources, Flood Management, Hydropower Generation, Recreation, and Water Quality	2-22
2.4	Action Alternatives	2-23
2.4.1	Management Measures Common to All Action Alternatives	2-23
2.4.2	Construction Activities Common to All Action Alternatives.....	2-26
2.4.3	Environmental Commitments Common to All Action Alternatives.....	2-40
2.4.4	Environmental Commitments Common to All Action Alternatives	2-42
2.4.5	Comprehensive Plan 1 (CP1) – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability	2-47
2.4.6	Comprehensive Plan 2 (CP2) – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability.....	2-59
2.4.7	Comprehensive Plan (CP3) – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability	2-67
2.4.8	Comprehensive Plan 4 (CP4) – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability	2-75
2.4.9	Comprehensive Plan 5 (CP5) – 18.5-Foot Dam Raise, Combination Plan....	2-85
2.5	Comparison of Alternatives	2-91
2.5.1	Completeness	2-91
2.5.2	Effectiveness	2-93
2.5.3	Efficiency	2-94
2.5.4	Acceptability	2-94
2.6	Preferred Alternative and Rationale for Selection	2-94
2.6.1	Summary of Comparison.....	2-94
2.6.2	Rationale for Plan Selection	2-94

Chapter 3 Considerations for Describing Affected Environment and Environmental Consequences..... **3-1**

3.1	Introduction.....	3-1
3.2	Chapter Contents and Definition of Terms.....	3-1
3.2.1	NEPA Requirements.....	3-2
3.2.2	Approach to Affected Environment	3-3
3.2.3	Methods and Assumptions.....	3-4
3.2.4	Significance Criteria	3-6
3.2.5	Impact Comparisons and Definitions	3-7
3.2.6	Impact Levels	3-7
3.2.7	Mitigation Development Process and Objectives	3-9
3.2.8	Significance after Mitigation	3-9
3.2.9	Cumulative Effects.....	3-9
3.3	Resources Eliminated from Further Consideration.....	3-45
3.4	Regulatory Framework	3-46
3.4.1	Federal	3-46
3.4.2	State	3-58
3.4.3	Regional and Local	3-64

Chapter 4 Geology, Geomorphology, Minerals, and Soils	4-1
4.1 Affected Environment.....	4-1
4.1.1 Geology	4-2
4.1.2 Geologic Hazards	4-14
4.1.3 Geomorphology	4-22
4.1.4 Mineral Resources	4-28
4.1.5 Soils	4-30
4.2 Regulatory Framework	4-41
4.2.1 Federal	4-41
4.2.2 State	4-44
4.2.3 Regional and Local	4-47
4.3 Environmental Consequences and Mitigation Measures.....	4-48
4.3.1 Methods and Assumptions.....	4-48
4.3.2 Criteria for Determining Significance of Effects	4-51
4.3.3 Topics Eliminated from Further Discussion	4-52
4.3.4 Direct and Indirect Effects.....	4-53
4.3.5 Mitigation Measures	4-82
4.3.6 Cumulative Effects.....	4-89
Chapter 5 Air Quality and Climate.....	5-1
5.1 Affected Environment.....	5-1
5.1.1 Regional Climate in the Primary Study Area.....	5-3
5.1.2 Criteria Air Pollutants	5-3
5.1.3 Monitoring Station Data and Criteria Pollutant Attainment Area Designations	5-4
5.1.4 Toxic Air Contaminants in the Primary Study Area.....	5-6
5.1.5 Global Study Area.....	5-9
5.2 Regulatory Framework	5-10
5.2.1 Federal	5-10
5.2.2 State	5-13
5.2.3 Regional and Local	5-21
5.3 Environmental Consequences and Mitigation Measures.....	5-24
5.3.1 Methods and Assumptions.....	5-24
5.3.2 Criteria for Determining Significance of Effects	5-25
5.3.3 Topics Eliminated from Further Consideration	5-29
5.3.4 Direct and Indirect Effects.....	5-29
5.3.5 Mitigation Measures	5-51
5.3.6 Cumulative Effects.....	5-57
Chapter 6 Hydrology, Hydraulics, and Water Management.....	6-1
6.1 Affected Environment.....	6-1
6.1.1 Storage Facilities.....	6-1
6.1.2 Diversion Facilities	6-2
6.1.3 Hydrology and Hydraulics.....	6-2

Shasta Lake Water Resources Investigation
Environmental Impact Statement

6.1.4	Surface Water Supply	6-5
6.1.5	Flood Management	6-6
6.1.6	South Delta Water Levels	6-10
6.1.7	Groundwater Resources.....	6-10
6.2	Regulatory Setting	6-13
6.2.1	Federal	6-13
6.2.2	State	6-19
6.2.3	Regional and Local	6-25
6.3	Environmental Consequences and Mitigation Measures.....	6-29
6.3.1	Methods and Assumptions.....	6-29
6.3.2	Criteria for Determining Significance of Effects	6-32
6.3.3	Direct and Indirect Effects	6-37
6.3.4	Mitigation Measures	6-108
6.3.5	Cumulative Effects.....	6-111
Chapter 7	Water Quality.....	7-1
7.1	Affected Environment.....	7-1
7.1.1	Overview of Water Quality Conditions	7-1
7.1.2	Sediment.....	7-7
7.1.3	Temperature	7-10
7.1.4	Metals	7-12
7.1.5	Salinity.....	7-16
7.2	Regulatory Framework	7-17
7.2.1	Federal	7-18
7.2.2	State	7-26
7.2.3	Local	7-33
7.3	Environmental Consequences and Mitigation Measures.....	7-34
7.3.1	Methods and Assumptions.....	7-34
7.3.2	Criteria for Determining Significance of Effects	7-38
7.3.3	Topics Eliminated from Further Consideration	7-42
7.3.4	Direct and Indirect Effects	7-42
7.3.5	Mitigation Measures	7-166
7.3.6	Cumulative Effects.....	7-181
Chapter 8	Noise and Vibration	8-1
8.1	Affected Environment.....	8-1
8.1.1	Acoustic Fundamentals	8-1
8.1.2	Existing Noise Sources and Levels	8-7
8.1.3	Existing Noise-Sensitive Land Uses	8-11
8.2	Regulatory Framework	8-11
8.2.1	Federal	8-11
8.2.2	State	8-12
8.2.3	Regional and Local	8-14

8.3	Environmental Consequences and Mitigation Measures.....	8-21
8.3.1	Methods and Assumptions.....	8-21
8.3.2	Criteria for Determining Significance of Effects	8-22
8.3.3	Topics Eliminated from Further Consideration	8-23
8.3.4	Direct and Indirect Effects	8-23
8.3.5	Mitigation Measures	8-35
8.3.6	Cumulative Effects.....	8-37
Chapter 9	Hazards and Hazardous Materials and Waste	9-1
9.1	Affected Environment.....	9-1
9.1.1	Hazards.....	9-2
9.1.2	Hazardous Materials and Waste	9-7
9.2	Regulatory Framework	9-12
9.2.1	Federal	9-12
9.2.2	State	9-17
9.2.3	Regional and Local	9-20
9.3	Environmental Consequences and Mitigation Measures.....	9-20
9.3.1	Methods and Assumptions.....	9-20
9.3.2	Criteria for Determining Significance of Effects	9-20
9.3.3	Topics Eliminated from Further Consideration	9-21
9.3.4	Direct and Indirect Effects	9-21
9.3.5	Mitigation Measures	9-37
9.3.6	Cumulative Effects.....	9-43
Chapter 10	Agriculture and Important Farmland	10-1
10.1	Affected Environment.....	10-1
10.1.1	Agriculture	10-1
10.1.2	Important Farmland	10-6
10.1.3	Williamson Act	10-11
10.1.4	Forest Land.....	10-11
10.2	Regulatory Framework	10-16
10.2.1	Federal	10-16
10.2.2	State	10-16
10.2.3	Regional and Local	10-20
10.3	Environmental Consequences and Mitigation Measures.....	10-21
10.3.1	Methods and Assumptions.....	10-21
10.3.2	Criteria for Determining Significance of Effects	10-22
10.3.3	Topics Eliminated from Further Consideration	10-22
10.3.4	Direct and Indirect Effects	10-23
10.3.5	Mitigation Measures	10-43
10.3.6	Cumulative Effects.....	10-47

Chapter 11 Fisheries and Aquatic Ecosystems.....	11-1
11.1 Affected Environment.....	11-1
11.1.1 Aquatic Habitat	11-1
11.1.2 Fish Species.....	11-7
11.1.3 Aquatic Macroinvertebrates.....	11-21
11.2 Regulatory Framework	11-24
11.2.1 Federal	11-24
11.2.2 State	11-37
11.2.3 Regional and Local	11-39
11.2.4 Federal, State, and Local Programs and Projects.....	11-40
11.3 Environmental Consequences and Mitigation Measures.....	11-44
11.3.1 Methods and Assumptions.....	11-44
11.3.2 Criteria for Determining Significance of Effects	11-64
11.3.3 Direct and Indirect Effects	11-66
11.3.4 Mitigation Measures	11-263
11.3.5 Cumulative Effects.....	11-277
Chapter 12 Botanical Resources and Wetlands	12-1
12.1 Affected Environment.....	12-1
12.1.1 Vegetation Communities	12-5
12.1.2 Special-Status Species	12-32
12.1.3 Invasive Species	12-57
12.1.4 Waters of the United States, Including Wetlands, in Shasta Lake and Vicinity	12-62
12.2 Regulatory Framework	12-67
12.2.1 Federal	12-67
12.2.2 State	12-74
12.2.3 Local	12-76
12.2.4 Federal, State, and Local Programs and Projects.....	12-77
12.3 Environmental Consequences and Mitigation Measures.....	12-82
12.3.1 Methods and Assumptions.....	12-82
12.3.2 Criteria for Determining Significance of Effects	12-86
12.3.3 Topics Eliminated from Further Consideration	12-88
12.3.4 Direct and Indirect Effects	12-88
12.3.5 Mitigation Measures	12-146
12.3.6 Cumulative Effects.....	12-171
Chapter 13 Wildlife Resources	13-1
13.1 Affected Environment.....	13-1
13.1.1 Wildlife.....	13-5
13.1.2 Special-Status Species	13-26
13.1.3 Other Wildlife Resources.....	13-63
13.2 Regulatory Framework	13-64

13.2.1 Federal	13-64
13.2.2 State	13-71
13.2.3 Regional and Local	13-74
13.2.4 Federal, State, and Local Programs and Projects	13-75
13.3 Environmental Consequences and Mitigation Measures.....	13-80
13.3.1 Methods and Assumptions.....	13-80
13.3.2 Criteria for Determining Significance of Effects	13-82
13.3.3 Topics Eliminated from Further Consideration	13-83
13.3.4 Direct and Indirect Effects	13-83
13.3.5 Mitigation Measures	13-185
13.3.6 Cumulative Effects.....	13-224
Chapter 14 Cultural Resources.....	14-1
14.1 Affected Environment.....	14-1
14.1.1 Regional Setting	14-2
14.1.2 Archaeological Resources and Historical Structures	14-6
14.2 Regulatory Framework	14-11
14.2.1 Federal	14-11
14.2.2 State	14-12
14.2.3 Regulatory Compliance	14-12
14.3 Environmental Consequences and Mitigation Measures.....	14-14
14.3.1 Impact Assessment Methods and Assumptions	14-14
14.3.2 Criteria for Determining Significance of Effects	14-17
14.3.3 Direct and Indirect Effects	14-19
14.3.4 Mitigation Measures	14-29
14.3.5 Cumulative Effects.....	14-35
Chapter 15 Indian Trust Assets	15-1
15.1 Affected Environment.....	15-1
15.2 Regulatory Framework	15-5
15.3 Environmental Consequences and Mitigation Measures.....	15-6
15.3.1 Methods and Assumptions.....	15-6
15.3.2 Direct and Indirect Effects	15-6
Chapter 16 Socioeconomics, Population, and Housing.....	16-1
16.1 Affected Environment.....	16-1
16.1.1 Socioeconomics	16-1
16.1.2 Population.....	16-6
16.1.3 Housing	16-7
16.2 Regulatory Framework	16-8
16.2.1 Federal	16-9
16.2.2 State	16-10
16.2.3 Regional and Local	16-10

Shasta Lake Water Resources Investigation
Environmental Impact Statement

16.3 Environmental Consequences and Mitigation Measures	16-13
16.3.1 Methods and Assumptions.....	16-13
16.3.2 Criteria for Determining Significance of Effects	16-16
16.3.3 Topics Eliminated from Further Discussion	16-17
16.3.4 Direct and Indirect Effects.....	16-17
16.3.5 Mitigation Measures	16-58
16.3.6 Cumulative Effects.....	16-63
Chapter 17 Land Use and Planning	17-1
17.1 Affected Environment.....	17-1
17.1.1 Land Use	17-1
17.1.2 Planning.....	17-8
17.2 Regulatory Framework	17-15
17.2.1 Federal	17-15
17.2.2 State	17-17
17.2.3 Regional and Local	17-19
17.3 Environmental Consequences and Mitigation Measures.....	17-21
17.3.1 Methods and Assumptions.....	17-21
17.3.2 Criteria for Determining Significance of Effects	17-22
17.3.3 Topics Eliminated from Further Consideration	17-22
17.3.4 Direct and Indirect Effects	17-23
17.3.5 Mitigation Measures	17-32
17.3.6 Cumulative Effects.....	17-36
Chapter 18 Recreation and Public Access	18-1
18.1 Affected Environment.....	18-1
18.1.1 Recreation.....	18-1
18.2 Regulatory Framework	18-17
18.2.1 Federal	18-17
18.2.2 State	18-20
18.2.3 Regional and Local	18-21
18.3 Environmental Consequences and Mitigation Measures.....	18-24
18.3.1 Methods and Assumptions.....	18-24
18.3.2 Criteria for Determining Significance of Effects	18-26
18.3.3 Topics Eliminated from Further Consideration	18-27
18.3.4 Direct and Indirect Effects	18-27
18.3.5 Mitigation Measures	18-83
18.3.6 Cumulative Effects.....	18-93
Chapter 19 Aesthetics and Visual Resources.....	19-1
19.1 Affected Environment.....	19-1
19.1.1 Visual Environment	19-1
19.2 Regulatory Framework	19-73

19.2.1 Federal	19-73
19.2.2 State	19-75
19.2.3 Regional and Local	19-75
19.3 Environmental Consequences and Mitigation Measures.....	19-76
19.3.1 Methods and Assumptions.....	19-76
19.3.2 Criteria for Determining Significance of Effects	19-77
19.3.3 Topics Eliminated from Further Consideration	19-78
19.3.4 Direct and Indirect Effects	19-78
19.3.5 Mitigation Measures	19-87
19.3.6 Cumulative Effects.....	19-90
Chapter 20 Transportation and Traffic.....	20-1
20.1 Affected Environment.....	20-1
20.1.1 Roadways	20-1
20.1.2 Public Transit	20-3
20.1.3 Railroads.....	20-3
20.1.4 Water Navigation	20-4
20.1.5 Airports.....	20-5
20.2 Regulatory Framework	20-5
20.2.1 Federal	20-5
20.2.2 State	20-5
20.2.3 Regional and Local	20-6
20.3 Environmental Consequences and Mitigation Measures.....	20-6
20.3.1 Methods and Assumptions.....	20-7
20.3.2 Criteria for Determining Significance of Effects	20-23
20.3.3 Topics Eliminated from Further Consideration	20-24
20.3.4 Direct and Indirect Effects	20-24
20.3.5 Mitigation Measures	20-44
20.3.6 Cumulative Effects.....	20-52
Chapter 21 Utilities and Service Systems.....	21-1
21.1 Affected Environment.....	21-1
21.1.1 Water Supply.....	21-2
21.1.2 Wastewater Infrastructure.....	21-11
21.1.3 Stormwater Drainage and Infrastructure	21-15
21.1.4 Solid Waste Management	21-16
21.1.5 Electrical Service and Infrastructure	21-17
21.1.6 Natural Gas Service and Infrastructure	21-19
21.1.7 Telecommunications	21-19
21.2 Regulatory Framework	21-20
21.2.1 Federal	21-20
21.2.2 State	21-22
21.2.3 Regional and Local	21-24
21.3 Environmental Consequences and Mitigation Measures.....	21-24

Shasta Lake Water Resources Investigation
Environmental Impact Statement

21.3.1 Methods and Assumptions.....	21-24
21.3.2 Criteria for Determining Significance of Effects	21-25
21.3.3 Topics Eliminated from Further Consideration	21-26
21.3.4 Direct and Indirect Effects	21-26
21.3.5 Mitigation Measures	21-46
21.3.6 Cumulative Effects.....	21-51
Chapter 22 Public Services.....	22-1
22.1 Affected Environment.....	22-1
22.1.1 Fire Protection Services	22-2
22.1.2 Emergency Services.....	22-4
22.1.3 Law Enforcement.....	22-6
22.1.4 Schools	22-7
22.2 Regulatory Framework	22-8
22.2.1 Federal	22-8
22.2.2 State	22-9
22.2.3 Regional and Local	22-10
22.3 Environmental Consequences and Mitigation Measures.....	22-10
22.3.1 Methods and Assumptions.....	22-10
22.3.2 Criteria for Determining Significance of Effects	22-10
22.3.3 Topics Eliminated from Further Consideration	22-11
22.3.4 Direct and Indirect Effects	22-11
22.3.5 Mitigation Measures	22-23
22.3.6 Cumulative Effects.....	22-27
Chapter 23 Power and Energy.....	23-1
23.1 Affected Environment.....	23-1
23.1.1 Shasta Lake and Vicinity	23-1
23.1.2 Upper Sacramento River (Shasta Dam to Red Bluff).....	23-2
23.1.3 Lower Sacramento River and Delta	23-2
23.1.4 CVP/SWP Service Areas.....	23-3
23.2 Regulatory Framework	23-6
23.2.1 Federal	23-6
23.2.2 State	23-6
23.2.3 Regional and Local	23-6
23.3 Environmental Consequences and Mitigation Measures.....	23-7
23.3.1 Methods and Assumptions.....	23-7
23.3.2 Criteria for Determining Significance of Effects	23-9
23.3.3 Direct and Indirect Effects	23-11
23.3.4 Mitigation Measures	23-56
23.3.5 Cumulative Effects.....	23-57

Chapter 24 Environmental Justice.....	24-1
24.1 Affected Environment.....	24-1
24.1.1 Minority and Low-Income Populations	24-1
24.2 Regulatory Framework	24-7
24.2.1 Federal	24-7
24.2.2 State	24-8
24.2.3 Regional and Local	24-8
24.3 Environmental Consequences and Mitigation Measures.....	24-8
24.3.1 Methods and Assumptions.....	24-8
24.3.2 Criteria for Determining Disproportionately High and Adverse Effects	24-10
24.3.3 Topics Eliminated from Further Consideration	24-10
24.3.4 Direct and Indirect Effects	24-10
24.3.5 Mitigation Measures	24-28
24.3.6 Cumulative Effects.....	24-31
Chapter 25 Wild and Scenic River Considerations for McCloud River.....	25-1
25.1 Background	25-1
25.2 Regulatory Framework	25-6
25.2.1 Federal	25-6
25.2.2 State	25-7
25.3 Affected Environment.....	25-8
25.3.1 The McCloud River	25-9
25.3.2 The McCloud River's Wild and Scenic Values	25-11
25.4 Environmental Consequences and Mitigation Measures.....	25-22
25.4.1 Methods and Assumptions.....	25-22
25.4.2 Criteria for Determining Significance of Effects	25-24
25.4.3 Direct and Indirect Effects	25-24
25.4.4 Mitigation Measures	25-36
25.4.5 Topics Eliminated from Further Consideration	25-37
25.4.6 Cumulative Effects.....	25-37
Chapter 26 Other Required Disclosures	26-1
26.1 Significant Adverse Effects that Cannot be Avoided If a Project is Implemented	26-1
26.2 Relationship of Short-Term Uses and Long-Term Productivity.....	26-2
26.3 Irreversible and Irretrievable Commitments of Resources	26-3
26.4 Growth-Inducing Impacts	26-4
26.4.1 Increased Construction Work	26-6
26.4.2 Increased Flood Protection	26-6
26.4.3 Increased Water Supply Reliability.....	26-7
26.5 Identification of Environmental Preferences for Alternatives	26-9
26.5.1 Least Environmentally Damaging Practicable Alternative	26-9

Shasta Lake Water Resources Investigation
Environmental Impact Statement

26.5.2 Environmentally Preferable Alternative/Environmentally Superior Alternative	26-9
26.6 Compliance with Applicable Laws, Policies, and Plans	26-10
26.6.1 Federal Requirements	26-10
26.6.2 State Requirements	26-16
26.6.3 Local Plans and Policies	26-20
Chapter 27 Public Involvement, Consultation, and Coordination	27-1
27.1 Public Involvement Through Project Scoping	27-1
27.1.1 Notice of Intent to Propose an Environmental Impact Statement	27-1
27.1.2 Public Scoping Meetings	27-2
27.2 Other Public Outreach.....	27-3
27.3 Consultation and Coordination	27-4
27.3.1 Consultation and Coordination with Agencies	27-4
27.3.2 Consultation and Coordination with Tribal Governments.....	27-4
27.3.3 Coordination with Native American Tribal Groups	27-5
27.4 Major Topics of Interest.....	27-5
27.5 Additional Steps in the Environmental Review Process.....	27-6
Chapter 28 References.....	28-1
Chapter 29 PDEIS Distribution List	29-1
29.1 Document Availability.....	29-1
29.2 Agencies and Organizations Receiving Copies of the PDEIS.....	29-1
29.2.1 Federal and State Agencies.....	29-1
29.2.2 Regional and Local Entities.....	29-2
29.2.3 Other Interested Parties.....	29-3
Chapter 30 List of EIS Preparers.....	30-1
Chapter 31 Index.....	31-1

Tables

Table 1-1. Agency Roles and Responsibilities	1-19
Table 2-1. Management Measures to Address Objectives.....	2-6
Table 2-2. Summary of Concept Plan Features	2-11
Table 2-3. Scenarios Considered for Cold-Water Storage – Anadromous Fish Survival Focus with Water Supply Reliability	2-14
Table 2-4. Scenarios Considered to Augment Flows – Anadromous Fish Survival Focus Plan.....	2-15
Table 2-5. Eliminated Scenarios Considered to Augment Flows – Anadromous Fish Survival Focus Plan	2-19
Table 2-6. Eliminated Scenarios Considered for Cold-Water Storage – Anadromous Fish Survival Focus Plan.....	2-20
Table 2-7. Features of Proposed Bridge Relocations Common to All Action Alternatives.....	2-33
Table 2-8. Physical Features of Action Alternatives	2-49
Table 2-9. Reservoir Clearing Treatment Applied – CP1.....	2-53
Table 2-10. Physical Features for Proposed Modifications of Shasta Dam and Appurtenances – CP1	2-53
Table 2-11. Physical Features for Proposed Dikes – CP1	2-54
Table 2-12. Physical Features for Proposed Road Relocations by Major Road Focus Area – CP1	2-55
Table 2-13. Recreation Facilities to Be Modified or Relocated – CP1	2-56
Table 2-14. Recreation and Nonrecreation Demolition and Construction Material Quantities – CP1	2-56
Table 2-15. Physical Features for Proposed Utilities Relocations – CP1.....	2-57
Table 2-16. Reservoir Clearing Treatment Applied – CP2.....	2-62
Table 2-17. Physical Features for Proposed Modifications of Shasta Dam and Appurtenances – CP2	2-62
Table 2-18. Physical Features for Proposed Dikes – CP2	2-63
Table 2-19. Physical Features for Proposed Road Relocations by Major Road Focus Area – CP2	2-64
Table 2-20. Recreation Facilities to Be Modified or Relocated – CP2	2-65
Table 2-21. Recreation Facilities Demolition and Construction Material Quantities – CP2	2-65
Table 2-22. Physical Features for Proposed Utilities Relocations – CP2.....	2-66
Table 2-23. Reservoir Clearing Treatment Applied – CP3, CP4, and CP5	2-70
Table 2-24. Physical Features for Proposed Modifications of Shasta Dam and Appurtenances – CP3, CP4, and CP5	2-70
Table 2-25. Physical Features for Proposed Dikes – CP3, CP4, and CP5.....	2-71
Table 2-26. Physical Features for Proposed Road Relocations by Major Road Focus Area – CP3, CP4, and CP5.....	2-72
Table 2-27. Recreation Facilities to Be Modified or Relocated – CP3, CP4, and CP5	2-73
Table 2-28. Recreation Facilities Demolition and Construction Material Quantities – CP3, CP4, and CP5	2-73

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 2-29. Physical Features for Proposed Utilities Relocations for CP3, CP4, and CP5.....	2-74
Table 2-30. Proposed Structural Enhancement by Arm of Lake and by Arm.....	2-90
Table 2-31. Proposed Vegetative Enhancement Treatment of Lake and by Arm	2-91
Table 2-32. Summary of Potential Features and Major Benefits of SLWRI Alternatives.....	2-92
Table 3-1. Present and Reasonably Foreseeable Future Actions Included in the Qualitative Analysis of Cumulative Impacts, by Resource Area	3-12
Table 4-1. Key to Bedrock Geology Map Units – Shasta Lake and Vicinity.....	4-6
Table 4-2. Stratigraphic Column of Formations of the Eastern Klamath Mountain Belt.....	4-8
Table 4-3. Areal Extent of Bedrock Types – Shasta Lake and Vicinity (Impoundment Area)	4-10
Table 4-4. Areal Extent of Bedrock Types – Shasta Lake and Vicinity (Relocation Areas).....	4-11
Table 4-5. Areal Extent of Mapped Slope Instability Hazards – Shasta Lake and Vicinity (Impoundment Area)	4-19
Table 4-6. Areal Extent of Mapped Slope Instability Hazards – Shasta Lake and Vicinity (Relocation Areas).....	4-19
Table 4-7. Characteristics of Watersheds Adjacent and Directly Tributary to Shasta Lake.....	4-26
Table 4-8. Key to Soil Map Units – Shasta Lake and Vicinity.....	4-33
Table 4-8. Key to Soil Map Units – Shasta Lake and Vicinity (contd.)	4-34
Table 4-9. Areal Extent of Soil Map Units – Shasta Lake and Vicinity (Impoundment Area)	4-34
Table 4-10. Areal Extent of Soil Map Units – Shasta Lake and Vicinity (Relocation Areas)	4-36
Table 4-11. Summary of Soil Erosion Hazard – Shasta Lake and Vicinity (Impoundment Area)	4-37
Table 4-12. Summary of Soil Erosion Hazard – Shasta Lake and Vicinity (Relocation Areas)	4-37
Table 4-13. Summary of Mitigation Measures for Geology, Geomorphology, Minerals, and Soils	4-83
Table 5-1. Summary of Annual Ambient Air Quality Data (2007–2009).....	5-5
Table 5-2. Ambient Air Quality Standards and Designations	5-7
Table 5-3. Shasta County Air Quality Management District’s Air Quality Emission Thresholds.....	5-27
Table 5-4. Construction Emissions for Postulated Dam Raise and Land Clearing, 3-Year Construction Period – CP1	5-34
Table 5-5. Average Annual Predicted Increase in User Days	5-35
Table 5-6. Operations Emissions for Shasta Dam Raise, 2015 – CP1	5-36
Table 5-7. Average Annual Hydropower Generation Benefits	5-40
Table 5-8. Operations Emissions for Shasta Dam Raise, 2015 – CP2	5-42
Table 5-9. Operations Emissions for Shasta Dam Raise, 2015—CP3	5-44
Table 5-10. Operations Emissions for Shasta Dam Raise, 2015 – CP5	5-50

Table 5-11. Summary of Mitigation Measures for Air Quality and Climate Change	5-52
Table 6-1. Relationship Between Shasta Cold-Water Volume and Sacramento River Water Temperature Compliance Location.....	6-14
Table 6-2. Groundwater Management Plans and County Ordinances for Redding and Sacramento Groundwater Basins.....	6-27
Table 6-3. Groundwater Management Plans and County Ordinances for North and South San Joaquin Groundwater Basins.....	6-28
Table 6-4. Impact Indicators and Significance Criteria for Water Management.....	6-33
Table 6-5. Simulated Monthly Average Sacramento River Flows Below Shasta Dam.....	6-41
Table 6-6. Simulated Average End-of-Month Shasta Reservoir Storage.....	6-42
Table 6-7. Simulated Average Volume of Water Less than 52°F in Shasta Reservoir at the End of April.....	6-43
Table 6-8. Simulated Average End-of-Month Trinity Lake Storage.....	6-44
Table 6-9. Simulated Monthly Average Tributary Inflow to the Sacramento River Between Keswick Dam and the Red Bluff Diversion Dam	6-45
Table 6-10. Simulated Monthly Average Sacramento River Flows Below the Red Bluff Diversion Dam	6-46
Table 6-11. Simulated Monthly Average Diversions to the Tehama-Colusa Canal in Dry and Critical Years	6-47
Table 6-12. Simulated Monthly Average Deliveries to North-of-Delta CVP Water Service Contractors and Refuges.....	6-48
Table 6-13. Simulated Monthly Average Deliveries to North-of-Delta CVP Water Service Contractors and Refuges in Dry and Critical Years	6-49
Table 6-14. Simulated Monthly Average Tributary Inflow to the Sacramento River Below the Red Bluff Diversion Dam.....	6-50
Table 6-15. Simulated Number of Years of Sacramento Valley Weir Spill.....	6-51
Table 6-16. Simulated Monthly Average Sacramento River Flows Below Freeport	6-52
Table 6-17. Simulated Average End-of-Month Oroville Reservoir Storage	6-53
Table 6-18. Simulated Monthly Average Feather River Flow Below the Thermalito Afterbay	6-54
Table 6-19. Simulated Average End-of-Month Folsom Reservoir Storage	6-54
Table 6-20. Simulated Monthly Average American River Flow Near the H Street Bridge	6-55
Table 6-21. Simulated Monthly Average Change in Delta Outflow	6-56
Table 6-22. Simulated Monthly Average Exports Through Jones Pumping Plant.....	6-57
Table 6-23. Simulated Monthly Average Exports Through Jones Pumping Plant in Dry and Critical Years	6-58
Table 6-24. Simulated Monthly Average Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	6-59
Table 6-25. Simulated Monthly Average Deliveries to South-of-Delta CVP Water Service Contractors and Refuges in Dry and Critical Years	6-60
Table 6-26. Simulated Annual Delivery Allocations to South-of-Delta CVP Water Service Contractors and Refuges for a 2005 Level of Development	6-63

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 6-27. Simulated Annual Delivery Allocations to South-of-Delta CVP Water Service Contractors and Refuges for a 2030 Level of Development	6-65
Table 6-28. Simulated Monthly Average Exports Through the Banks Pumping Plant	6-67
Table 6-29. Simulated Monthly Average Deliveries to SWP Table A Contractors South of the Delta	6-68
Table 6-30. Simulated Monthly Average Deliveries to SWP Table A Contractors South of the Delta in Dry and Critical Years.....	6-69
Table 6-31. Simulated Monthly Average San Joaquin River flows at Vernalis.....	6-70
Table 6-32. Simulated Monthly Maximum 15-Minute Change in Water Levels at Various Locations in the South Delta at Low-Low Tide.....	6-73
Table 6-33. Simulated Number of Years the Delta Changes from Excess to Balanced Condition	6-74
Table 6-34. Simulated Monthly Average Deliveries and Percent Change of Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	6-75
Table 6-35. Simulated Monthly Average Deliveries and Percent Change of Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	6-76
Table 6-36. Simulated Monthly Average Deliveries and Percent Change of Deliveries to SWP Table A Contractors South-of-Delta.....	6-77
Table 6-37. Simulated Monthly Maximum 15-Minute Change in Old River Water Levels near Tracy Road Bridge at Low-Low Tide	6-80
Table 6-38. Simulated Monthly Maximum 15-Minute Change in the Grant Line Canal Water Levels near the Grant Line Canal Barrier at Low-Low Tide	6-81
Table 6-39. Simulated Monthly Maximum 15-Minute Change in Middle River Water Levels near the Howard Road Bridge at Low-Low Tide.....	6-82
Table 6-40. Simulated Number of Years the Delta Changes from Excess to Balanced Condition	6-83
Table 6-41. Simulated Monthly Average Deliveries and Percent Change of Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	6-84
Table 6-42. Simulated Monthly Average Deliveries and Percent Change of Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	6-85
Table 6-43. Simulated Monthly Average Deliveries and Percent Change of Deliveries to SWP Table A Contractors South-of-Delta	6-86
Table 6-44. Simulated Monthly Maximum 15-Minute Change in Old River Water Levels near Tracy Road Bridge at Low-Low Tide	6-89
Table 6-45. Simulated Monthly Maximum 15-Minute Change in Grant Line Canal Water Levels near the Grant Line Canal Barrier at Low-Low Tide	6-90
Table 6-46. Simulated Monthly Maximum 15-Minute Change in Middle River Water Levels near the Howard Road Bridge at Low-Low Tide.....	6-91

Table 6-47. Simulated Number of Years the Delta Changes from Excess to Balanced Condition	6-92
Table 6-48. Simulated Monthly Average Deliveries and Percent Change of Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	6-93
Table 6-49. Simulated Monthly Average Deliveries and Percent Change of Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	6-94
Table 6-50. Simulated Monthly Average Deliveries and Percent Change of Deliveries to SWP Table A Contractors South-of-Delta	6-95
Table 6-51. Simulated Monthly Maximum 15-Minute Change in Old River Water Levels near Tracy Road Bridge at Low-Low Tide	6-97
Table 6-52. Simulated Monthly Maximum 15-Minute Change in Tyrant Line Canal Water Levels near the Grant Line Canal Barrier at Low-Low Tide	6-98
Table 6-53. Simulated Monthly Maximum 15-Minute Change in Middle River Water Levels near the Howard Road Bridge at Low-Low Tide	6-99
Table 6-54. Simulated Number of Years the Delta Changes from Excess to Balanced Condition	6-100
Table 6-55. Simulated Monthly Average Deliveries and Percent Change of Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	6-101
Table 6-56. Simulated Monthly Average Deliveries and Percent Change of Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	6-102
Table 6-57. Simulated Monthly Average Deliveries and Percent Change of Deliveries to SWP Table A Contractors South-of-Delta	6-103
Table 6-58. Summary of Mitigation Measures for Hydrology, Hydraulics, and Water Management.....	6-109
Table 7-1. Summary of Conventional Water Quality Constituents Collected in the Sacramento River at Red Bluff from 1996 to 1998	7-4
Table 7-2. 303(d) List of Water Quality Limited Segments, Shasta Lake, 2006	7-13
Table 7-3. Proposed TMDL Numeric Targets for Dissolved Cadmium, Copper, and Zinc for a 25-Mile Segment of the Upper Sacramento River between Keswick Dam and Cottonwood Creek near Balls Ferry in Shasta County	7-29
Table 7-4. Simulated Average End-of-Month Shasta Lake Storage – CP1	7-47
Table 7-5. Simulated Average Volume of Water Less than 52°F in Shasta Lake at the End of April – CP1	7-48
Table 7-6. Modeled Reduction in Daily Exceedences of Sacramento River Temperature Requirements (as Defined by the 2004 Biological Opinion for CVP and SWP Operations and Their Effects on the Sacramento River Winter-Run Chinook Salmon) for April 1 – October 31	7-52
Table 7-7. D-1641 Water Quality Objectives for the Sacramento River at Collinsville.....	7-56

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 7-8. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Collinsville	7-57
Table 7-9. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Collinsville	7-58
Table 7-10. D-1641 Water Quality Objectives for the San Joaquin River at Jersey Point.....	7-59
Table 7-11. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Jersey Point.....	7-60
Table 7-12. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Jersey Point	7-61
Table 7-13. D-1641 Water Quality Objective for the Sacramento River at Emmaton.....	7-62
Table 7-14. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Emmaton	7-63
Table 7-15. Simulated Number of Months of Exceedence of the Salinity Standard for the San Sacramento River at Emmaton.....	7-64
Table 7-16. D-1641 Water Quality Objective for Contra Costa Canal Pumping Plant No. 1	7-65
Table 7-17. Simulated Monthly Average Chlorides and Percent Change for the Old River at Rock Slough.....	7-66
Table 7-18. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Old River at Rock Slough.....	7-67
Table 7-19. D-1641 Water Quality Objective for the Delta-Mendota Canal at the Jones Pumping Plant.....	7-68
Table 7-20. Simulated Monthly Average Chlorides and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant	7-68
Table 7-21. Simulated Monthly Average Salinity and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant	7-69
Table 7-22. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Delta-Mendota Canal at the Jones Pumping Plant.....	7-70
Table 7-23. Simulated Number of Months of Exceedence of the Salinity Standard for the Delta-Mendota Canal at the Jones Pumping Plant	7-71
Table 7-24. D-1641 Water Quality Objective for the West Canal at the Mouth of the Clifton Court Forebay	7-72
Table 7-25. Simulated Monthly Average Chlorides and Percent Change for West Canal at the Clifton Court Forebay.....	7-72
Table 7-26. Simulated Monthly Average Salinity and Percent Change for West Canal at the Clifton Court Forebay	7-73
Table 7-27. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the West Canal at the Clifton Court Forebay	7-74
Table 7-28. Simulated Number of Months of Exceedence of the Salinity Standard for the West Canal at the Clifton Court Forebay	7-75
Table 7-29. D-1641 South Delta Water Quality Objective.....	7-76
Table 7-30. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Vernalis.....	7-77

Table 7-31. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Vernalis	7-78
Table 7-32. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Brandt Bridge	7-79
Table 7-33. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Brandt Bridge	7-80
Table 7-34. Simulated Monthly Average Salinity and Percent Change for the Old River near the Middle River	7-81
Table 7-35. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River near the Middle River	7-82
Table 7-36. Simulated Monthly Average Salinity and Percent Change for the Old River at Tracy Road Bridge	7-83
Table 7-37. Simulated Number of Days by Month of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge	7-84
Table 7-38. Simulated Monthly Average X2 Position.....	7-85
Table 7-39. Simulated Average Increased End-of-Month Shasta Lake Storage – CP2	7-87
Table 7-40. Simulated Average Volume of Water Less than 52°F in Shasta Lake at the End of April – CP2	7-88
Table 7-41. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Collinsville	7-93
Table 7-42. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Collinsville	7-94
Table 7-43. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Jersey Point.....	7-95
Table 7-44. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Jersey Point	7-96
Table 7-45. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Emmaton	7-97
Table 7-46. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Emmaton.....	7-98
Table 7-47. Simulated Monthly Average Chlorides and Percent Change for the Old River at Rock Slough.....	7-100
Table 7-48. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Old River at Rock Slough.....	7-101
Table 7-49. Simulated Monthly Average Chlorides and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant	7-102
Table 7-50. Simulated Monthly Average Salinity and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant	7-103
Table 7-51. Simulated Number of Months of Exceedence of the Salinity Standard for the Delta-Mendota Canal at the Jones Pumping Plant	7-104
Table 7-52. Simulated Monthly Average Chlorides and Percent Change for West Canal at the Clifton Court Forebay.....	7-105
Table 7-53. Simulated Monthly Average Salinity and Percent Change for West Canal at the Clifton Court Forebay.....	7-106

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 7-54. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the West Canal at the Clifton Court Forebay.....	7-107
Table 7-55. Simulated Number of Months of Exceedence of the Salinity Standard for the West Canal at the Clifton Court Forebay	7-108
Table 7-56. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Vernalis.....	7-109
Table 7-57. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Vernalis	7-110
Table 7-58. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Brandt Bridge	7-111
Table 7-59. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Brandt Bridge.....	7-112
Table 7-60. Simulated Monthly Average Salinity and Percent Change for the Old River near Middle River	7-113
Table 7-61. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River near Middle River.....	7-114
Table 7-62. Simulated Monthly Average Salinity and Percent Change for the Old River at Tracy Road Bridge	7-115
Table 7-63. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge	7-116
Table 7-64. Simulated Monthly Average X2 Position.....	7-117
Table 7-65. Simulated Average Increased End-of-Month Shasta Lake Storage – CP3 and CP5.....	7-120
Table 7-66. Simulated Average Volume of Water Less than 52°F in Shasta Lake at the End of April – CP3 and CP5.....	7-121
Table 7-67. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Collinsville	7-125
Table 7-68. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge	7-126
Table 7-69. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Jersey Point.....	7-127
Table 7-70. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Jersey Point	7-128
Table 7-71. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Emmaton	7-129
Table 7-72. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Emmaton.....	7-130
Table 7-73. Simulated Monthly Average Chlorides and Percent Change for the Old River at Rock Slough.....	7-131
Table 7-74. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Old River at Rock Slough.....	7-132
Table 7-75. Simulated Monthly Average Chlorides and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant	7-133
Table 7-76. Simulated Monthly Average Salinity and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant	7-134

Table 7-77. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Delta-Mendota Canal at the Jones Pumping Plant.....	7-135
Table 7-78. Simulated Number of Months of Exceedence of the Salinity Standard for the Delta-Mendota Canal at the Jones Pumping Plant	7-136
Table 7-79. Simulated Monthly Average Chlorides and Percent Change for West Canal at Clifton Court Forebay.....	7-137
Table 7-80. Simulated Monthly Average Salinity and Percent Change for the West Canal at the Clifton Court Forebay	7-138
Table 7-81. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the West Canal at the Clifton Court Forebay.....	7-139
Table 7-82. Simulated Number of Months of Exceedence of the Salinity Standard for the West Canal at the Clifton Court Forebay	7-140
Table 7-83. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Vernalis.....	7-141
Table 7-84. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Vernalis	7-142
Table 7-85. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Brandt Bridge	7-143
Table 7-86. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Brandt Bridge.....	7-144
Table 7-87. Simulated Monthly Average Salinity and Percent Change for the Old River near the Middle River	7-145
Table 7-88. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River near the Middle River.....	7-146
Table 7-89. Simulated Monthly Average Salinity and Percent Change for the Old River at Tracy Road Bridge	7-147
Table 7-90. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge	7-148
Table 7-91. Simulated Monthly Average X2 Position.....	7-149
Table 7-92. Simulated Average Increased End-of-Month Shasta Lake Storage – CP4	7-151
Table 7-93. Simulated Average Volume of Water Less than 52°F in Shasta Lake at the End of April – CP4	7-152
Table 7-94. Summary of Mitigation Measures for Water Quality.....	7-167
Table 8-1. Human Response to Different Levels of Groundborne Noise and Vibration	8-7
Table 8-2. Summary of Modeled Existing Traffic Noise Levels (Year 2006)	8-9
Table 8-3. Approximate Distance to Union Pacific Railroad Noise Contours	8-10
Table 8-4. State Noise-Compatibility Guidelines by Land-Use Category	8-13
Table 8-5. Noise Level Performance Standards for New Projects Affected by or Including Nontransportation Sources	8-15
Table 8-6. Requirements for an Acoustical Analysis	8-16
Table 8-7. Maximum Allowable Noise Exposure Transportation Noise Sources.....	8-17
Table 8-8. Transportation Noise–Related Land Use Compatibility Guidelines for Development in Shasta County	8-18
Table 8-9. Requirements for an Acoustical Analysis Prepared In Tehama County	8-19

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 8-10. Noise Standards for New Uses Affected By Nontransportation Noise in Tehama County.....	8-21
Table 8-11. Typical Construction Equipment Noise Levels.....	8-27
Table 8-12. Summary of Mitigation Measures for Noise and Vibration.....	8-35
Table 9-1. Summary of Mitigation Measures for Hazards and Hazardous Materials and Waste	9-38
Table 10-1. California Water Balance Summary.....	10-5
Table 10-2. Acreage of Important Farmland in Shasta and Tehama Counties	10-7
Table 10-3. Acreage of Important Farmland in Portions of Shasta and Tehama Counties Within the Primary Study Area	10-8
Table 10-4. Summary of Forest Land in the Impoundment and Relocation Areas	10-12
Table 10-5. Acreage of Forest Land that Would Be Affected by Inundation Under CP1	10-28
Table 10-6. Acreage of Forest Land that Would Be Affected by Inundation Under CP2	10-33
Table 10-7. Acreage of Forest Land that Would Be Affected by Inundation Under CP3	10-36
Table 10-8. Summary of Mitigation Measures for Agriculture and Important Farmland.....	10-44
Table 11-1. Special-Status Aquatic Species Potentially Occurring in the Primary and Extended Study Areas.....	11-8
Table 11-2. Fish Species Known to Occur in the Primary Study Area	11-14
Table 11-3. Number of Spawning Fish Incorporated into SALMOD Model.....	11-51
Table 11-4. Percent Mortality to Winter-Run Chinook Salmon Caused by Nonoperations-Related Effects and Operations-Related Effects Under Each Comprehensive Plan When the Starting Population is Based on the 1999 Through 2006 Average	11-88
Table 11-5. Average Annual Mortality Under Each Comprehensive Plan Caused by Project Activities to Winter-Run Chinook Salmon When the Starting Population is Based on the 1999 Through 2006 Average.....	11-89
Table 11-6. Mortality Parameters Ranked by Importance for Winter-Run Chinook Salmon by No-Action and Comprehensive Plans by Water-Year Type When the Starting Population Is Based on the 1999 Through 2006 Average.....	11-90
Table 11-7. Percent Mortality to Spring-Run Chinook Salmon Caused by Nonoperations-Related and Operations-Related Effects Under the No-Action Alternative and Comprehensive Plans When Starting Population Is Based on the 1999 Through 2006 Average	11-92
Table 11-8. Average Annual Mortality Under the No-Action Alternative and Each Comprehensive Plan Caused by Project Activities to Spring-Run Chinook Salmon When Starting Population is Based on 1999 Through 2006 Average.....	11-93
Table 11-9. Mortality Parameters Ranked by Importance for Spring-Run Chinook Salmon by Comprehensive Plan and Water-Year Type When Starting Population Is Based on 1999 Through 2006 Average	11-94

Table 11-10. Percent Mortality to Fall-Run Chinook Salmon Caused by Nonoperations-Related Effects and Operations-Related Effects Under the Comprehensive Plans When Starting Population Is Based on the 1999 Through 2006 Average	11-97
Table 11-11. Average Annual Mortality Under Each Comprehensive Plan Caused by Project Activities to Fall-Run Chinook Salmon When the Starting Population Is Based on 1999 Through 2006 Average	11-98
Table 11-12. Mortality Parameters Ranked by Importance for Fall-Run Chinook Salmon by the No-Action Alternative or Comprehensive Plan and Water-Year Type When the Starting Population Is Based on the 1999 Through 2006 Average	11-100
Table 11-13. Percent Mortality to Late Fall-Run Chinook Salmon Caused by Nonoperations-Related and Operations-Related Effects Under the No-Action Alternative and Comprehensive Plans When Starting Population is Based on 1999 Through 2006 Average	11-102
Table 11-14. Average Annual Mortality Under Each Comprehensive Plan Caused by Project Activities to Late Fall-Run Chinook Salmon When Starting Population Is Based on 1999 Through 2006 Average	11-103
Table 11-15. Mortality Parameters Ranked by Importance for Late Fall-Run Chinook Salmon by Comprehensive Plan and Water-Year Type When Starting Population Is Based on 1999 Through 2006 Average	11-105
Table 11-16. Delta Outflow Under Existing Conditions, No-Action Alternative, and CP1.....	11-118
Table 11-17. Delta Inflow Under Existing Conditions, No-Action Alternative, and CP1	11-121
Table 11-18. Sacramento River Inflow Under Existing Conditions, No-Action Alternative, and CP1.....	11-124
Table 11-19. San Joaquin River Flow at Vernalis Under Existing Conditions, and CP1	11-127
Table 11-20. X2 Under Existing Conditions, No-Action Alternative, and CP1.....	11-130
Table 11-21. Old and Middle River Reverse Flows for Existing Conditions, No-Action Alternative, and CP1.....	11-132
Table 11-22. Entrainment at the CVP and SWP facilities Under Existing Conditions, No-Action Alternative, and CP1	11-135
Table 11-23. Delta Outflow Under Existing Conditions, No-Action Alternative, and CP2.....	11-164
Table 11-24. Delta Inflow Under Existing Conditions, No-Action Alternative, and CP2	11-167
Table 11-25. Sacramento River Inflow Under Existing Conditions, No-Action Alternative, and CP2.....	11-169
Table 11-26. San Joaquin River Flow at Vernalis Under Existing Conditions and CP2	11-172
Table 11-27. X2 Under Existing Conditions, No-Action Alternative, and CP2.....	11-174
Table 11-28. Old and Middle Rivers Reverse Flows for Existing Conditions, No-Action Alternative, and CP2.....	11-176

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 11-29. Entrainment at the CVP and SWP Facilities under Existing Conditions, No-Action Alternative, and CP2	11-179
Table 11-30. Delta Outflow Under Existing Conditions, No-Action Alternative, and CP3.....	11-208
Table 11-31. Delta Inflow Under Existing Conditions, No-Action Alternative, and CP3	11-210
Table 11-32. Sacramento River Inflow Under Existing Conditions, No-Action Alternative, and CP3.....	11-213
Table 11-33. San Joaquin River Flow at Vernalis Under Existing Conditions, and CP3	11-215
Table 11-34. Difference in X2 Under Existing Conditions, No-Action Alternative, and CP3.....	11-217
Table 11-35. Reverse Flows Under Existing Conditions, No-Action Alternative, and CP3.....	11-219
Table 11-36. Entrainment at the CVP and SWP Facilities Comparing Existing Conditions, No-Action Alternative, and CP3	11-222
Table 11-37. Summary of Mitigation Measures for Fisheries and Aquatic Ecosystems	11-264
Table 12-1. Summary of Plant Communities in the Impoundment Area	12-6
Table 12-2. Summary of Plant Communities in the Relocation Areas.....	12-7
Table 12-3. Plant Species of Concern with Potential to Occur in the Shasta Lake and Vicinity Portion of the Primary Study Area	12-34
Table 12-4. Special-Status Plant Species Known or with Potential to Occur in the Primary Study Area, Along the Sacramento River from Shasta Dam to Red Bluff Diversion Dam.....	12-52
Table 12-5. Nonnative Plant Species Known to Occur in the Shasta Lake and Vicinity Portion of the Primary Study Area	12-58
Table 12-6. Cal-IPC High-Rated Invasive Plants of Sacramento Valley and Delta Riparian and Marsh Habitats	12-61
Table 12-7. Jurisdictional Waters in the Impoundment Area	12-63
Table 12-8. Cross Reference of MCV Vegetation Types and CWHR Habitat Types.....	12-85
Table 12-9. Impacts to Jurisdictional Waters (Acres*) in the Impoundment Area (6.5-Foot Dam Raise)	12-105
Table 12-10. Impacts to CWHR Habitats in the Impoundment Area (6.5-Foot Dam Raise)	12-105
Table 12-11. Impacts to CWHR Habitats in the Relocation Areas	12-106
Table 12-12. Impacts to Jurisdictional Waters (Acres*) in the Impoundment Area (12.5-Foot Dam Raise)	12-119
Table 12-13. Impacts to CWHR Habitats (Acres*) in the Impoundment Area (12.5-Foot Dam Raise)	12-120
Table 12-14. Impacts to Jurisdictional Waters (Acres*) in the Impoundment Area (18.5-Foot Dam Raise)	12-127
Table 12-15. Impacts to CWHR Habitats (Acres*) in the Impoundment Area (18.5-Foot Dam Raise)	12-128
Table 12-16. Summary of Mitigation Measures for Botanical Resources.....	12-147

Table 13-1. Summary of Wildlife Habitats in the Impoundment Area	13-6
Table 13-2. Summary of Wildlife Habitats in the Relocation Areas.....	13-6
Table 13-3. Wildlife Species of Concern in the Shasta Lake and Vicinity Portion of the Primary Study Area	13-28
Table 13-4. Special-Status Wildlife Species Known or with Potential to Occur in the Primary Study Area, Along the Sacramento River from Shasta Dam to Red Bluff Diversion Dam.....	13-57
Table 13-5. Sensitive Wildlife Species of Riparian and Perennial Wetland Communities Along the Sacramento River and in the Delta.....	13-61
Table 13-6. Impacts on Suitable Habitat for the Shasta Salamander in the Impoundment Area (6.5-Foot Dam Raise)	13-90
Table 13-7. Impacts on Suitable Habitat for the Shasta Salamander in Relocation Areas	13-90
Table 13-8. Impacts on Suitable Habitat for the Foothill Yellow-Legged and Tailed Frog in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)	13-92
Table 13-9. Impacts on Suitable Habitat for the Northwestern Pond Turtle in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise).....	13-94
Table 13-10. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)	13-97
Table 13-11. Impacts on Suitable Habitat for the Northern Spotted Owl in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise).....	13-99
Table 13-12. Impacts on Suitable Habitat for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise).....	13-102
Table 13-13. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise).....	13-104
Table 13-14. Impacts on Suitable Habitat for the Pacific Fisher in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise).....	13-106
Table 13-15. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise)	13-109
Table 13-16. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area and Relocation Areas (6.5-Foot Dam Raise).....	13-112
Table 13-17. Impacts on CWHR Habitats in the Impoundment Area (6.5-Foot Dam Raise)	13-114
Table 13-18. Impacts on CWHR Habitats in the Relocation Areas	13-114
Table 13-19. Impacts on Suitable Habitat for the Shasta Salamander in the Impoundment Area (12.5-Foot Dam Raise)	13-126
Table 13-20. Impacts on Suitable Habitat for the Foothill Yellow-Legged and Tailed Frog in the Impoundment Area (12.5-Foot Dam Raise)	13-127
Table 13-21. Impacts on Suitable Habitat for the Northwestern Pond Turtle in the Impoundment Area (12.5-Foot Dam Raise)	13-128
Table 13-22. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area (12.5-Foot Dam Raise).....	13-130

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 13-23. Impacts on Suitable Habitat for the Northern Spotted Owl in the Impoundment Area (12.5-Foot Dam Raise)	13-131
Table 13-24. Impacts on Suitable Habitat for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat in the Impoundment Area (12.5-Foot Dam Raise)	13-132
Table 13-25. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area (12.5-Foot Dam Raise)	13-133
Table 13-26. Impacts on Suitable Habitat for the Pacific Fisher in the Impoundment Area (12.5-Foot Dam Raise)	13-135
Table 13-27. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area (12.5-Foot Dam Raise)	13-137
Table 13-28. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area (12.5-Foot Dam Raise)	13-138
Table 13-29. Impacts on CWHR Habitats in the Impoundment Area (12.5-Foot Dam Raise)	13-139
Table 13-30. Impacts on Suitable Habitat for the Shasta Salamander in the Impoundment Area (18.5-Foot Dam Raise)	13-145
Table 13-31. Impacts on Suitable Habitat for the Foothill Yellow-Legged and Tailed Frog in the Impoundment Area (18.5-Foot Dam Raise)	13-146
Table 13-32. Impacts on Suitable Habitat for the Northwestern Pond Turtle in the Impoundment Area (18.5-Foot Dam Raise)	13-147
Table 13-33. Impacts on Suitable Habitat for the Bald Eagle in the Impoundment Area (18.5-Foot Dam Raise)	13-149
Table 13-34. Impacts on Suitable Habitat for the Northern Spotted Owl in the Impoundment Area (18.5-Foot Dam Raise)	13-150
Table 13-35. Impacts on Suitable Habitat for the Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat in the Impoundment Area (18.5-Foot Dam Raise)	13-151
Table 13-36. Impacts on Suitable Habitat for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, and Great Blue Heron in the Impoundment Area (18.5-Foot Dam Raise)	13-152
Table 13-37. Impacts on Suitable Habitat for the Pacific Fisher in the Impoundment Area (18.5-Foot Dam Raise)	13-154
Table 13-38. Impacts on Suitable Habitat for Special-Status Bats, American Marten, and Ringtail in the Impoundment Area (18.5-Foot Dam Raise)	13-155
Table 13-39. Impacts on Suitable Habitat for Special-Status Terrestrial Mollusks in the Impoundment Area (18.5-Foot Dam Raise)	13-157
Table 13-40. Impacts on CWHR Habitats in the Impoundment Area (18.5-Foot Dam Raise)	13-158
Table 13-41. Summary of Mitigation Measures for Wildlife Resources.....	13-186
Table 14-1. Cultural Resources Impacts for CP1	14-21
Table 14-2. Cultural Resources Impacts for CP2	14-23
Table 14-3. Cultural Resources Impacts for CP3	14-24

Table 14-4. Cultural Resources Impacts for CP4	14-26
Table 14-5. Cultural Resources Impacts for CP5	14-28
Table 14-6. Summary of Mitigation Measures for Cultural Resources.....	14-29
Table 15-1. Federally Recognized Tribes in Region Surrounding Primary Study Area.....	15-5
Table 16-1. Summary of Mitigation Measures for Socioeconomics, Population, and Housing	16-59
Table 17-1. Summary of Mitigation Measures for Land Use	17-33
Table 18-1. Summary of Public, Commercial, and Private Recreation Facilities on Shasta Lake	18-5
Table 18-2. Summary of Recreation Sites along the Sacramento River between Keswick Dam and Red Bluff Diversion Dam	18-14
Table 18-3. Effects of CP1 on Developed Recreation Facilities at Shasta Lake	18-31
Table 18-4. Tally of Shasta Lake Recreation Facilities Substantially Affected by CP1	18-34
Table 18-5. Effects of CP2 on Developed Recreation Facilities at Shasta Lake	18-49
Table 18-6. Tally of Shasta Lake Recreation Facilities Substantially Affected by CP2	18-52
Table 18-7. Effects of CP3 on Developed Recreation Facilities at Shasta Lake	18-60
Table 18-8. Tally of Shasta Lake Recreation Facilities Substantially Affected by CP3	18-64
Table 18-9. Summary of Mitigation Measures for Recreation and Public Access.....	18-84
Table 19-1. Shasta-Trinity National Forest Inventoried Visual Quality Objectives	19-5
Table 19-2. Key Observation Points.....	19-13
Table 19-3. Summary of Mitigation Measures for Aesthetics.....	19-87
Table 20-1. Average Daily Traffic Volume at the I-5/Turntable Bay Road and I-5/Bridge Bay Road Interchanges	20-2
Table 20-2. Named Road and Bridge Facilities that Would Require Relocation Under the SLWRI	20-7
Table 20-3. Summary of Mitigation Measures for Transportation and Traffic	20-45
Table 21-1. Waste Generated by Project Construction.....	21-33
Table 21-2. Summary of Mitigation Measures for Utilities and Service Systems	21-46
Table 22-1. Key Public Service Providers.....	22-2
Table 22-2. Summary of Mitigation Measures for Public Services.....	22-24
Table 23-1. Impact Indicators and Significance Criteria for Energy Generation and Usage.....	23-9
Table 23-2. Simulated Monthly Average Shasta Powerplant Energy Generation for No-Action Alternative.....	23-13
Table 23-3. Simulated Monthly Average CVP Energy Generation for No-Action Alternative	23-14
Table 23-4. Simulated Monthly Average SWP Energy Generation for No-Action Alternative	23-15
Table 23-5. Simulated Monthly Average CVP Energy Consumption for No-Action Alternative	23-16
Table 23-6. Simulated Monthly Average SWP Energy Consumption for No-Action Alternative	23-16

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Table 23-7. Simulated Monthly Average CVP Net Energy Generation for No-Action Alternative	23-17
Table 23-8. Simulated Monthly Average SWP Net Energy Generation for No-Action Alternative	23-18
Table 23-9. Simulated Monthly Average Pit 7 Powerplant Energy Generation for No-Action Alternative	23-18
Table 23-10. Simulated Monthly Average Shasta Powerplant Energy Generation for CP1	23-20
Table 23-11. Simulated Monthly Average CVP Energy Generation for CP1	23-21
Table 23-12. Simulated Monthly Average SWP Energy Generation for CP1	23-22
Table 23-13. Simulated Monthly Average CVP Energy Consumption for CP1	23-23
Table 23-14. Simulated Monthly Average SWP Energy Consumption for CP1.....	23-24
Table 23-15. Simulated Monthly Average CVP Net Energy Generation for CP1	23-25
Table 23-16. Simulated Monthly Average SWP Net Energy Generation for CP1.....	23-26
Table 23-17. Simulated Monthly Average Pit 7 Powerplant Energy Generation for CP1	23-27
Table 23-18. Simulated Monthly Average Shasta Powerplant Energy Generation for CP2.....	23-29
Table 23-19. Simulated Monthly Average CVP Energy Generation for CP2.....	23-30
Table 23-20. Simulated Monthly Average SWP Energy Generation for CP2	23-31
Table 23-21. Simulated Monthly Average CVP Energy Consumption for CP2	23-32
Table 23-22. Simulated Monthly Average SWP Energy Consumption for CP2.....	23-33
Table 23-23. Simulated Monthly Average CVP Net Energy Generation for CP2	23-34
Table 23-24. Simulated Monthly Average SWP Average Net Energy Generation for CP2.....	23-35
Table 23-25. Simulated Monthly Average Pit 7 Powerplant Energy Generation for CP2	23-36
Table 23-26. Simulated Monthly Average Shasta Powerplant Energy for Generation for CP3 and CP5	23-38
Table 23-27. Simulated Monthly Average CVP Energy Generation for CP3 and CP5	23-39
Table 23-28. Simulated Monthly Average SWP Energy Generation for CP3 and CP5	23-40
Table 23-29. Simulated Monthly Average CVP Energy Consumption for CP3 and CP5	23-41
Table 23-30. Simulated Monthly Average SWP Energy Consumption for CP3 and CP5	23-42
Table 23-31. Simulated Monthly Average CVP Net Energy Generation for CP3 and CP5.....	23-43
Table 23-32. Simulated Monthly Average SWP Net Energy Generation for CP3 and CP5.....	23-44
Table 23-33. Simulated Monthly Average Pit 7 Powerplant Energy Generation for CP3 and CP5.....	23-45
Table 23-34. Simulated Monthly Average Shasta Powerplant Energy Generation for CP4.....	23-47
Table 23-35. Simulated Monthly Average CVP Energy Generation for CP4.....	23-48

Table 23-36. Simulated Monthly Average SWP Energy Generation for CP4	23-49
Table 23-37. Simulated Monthly Average CVP Energy Consumption for CP4	23-50
Table 23-38. Simulated Monthly Average SWP Energy Consumption for CP4.....	23-51
Table 23-39. Simulated Monthly Average CVP Net Energy Generation for CP4.....	23-52
Table 23-40. Simulated Monthly Average SWP Net Energy Generation for CP4.....	23-53
Table 23-41. Simulated Monthly Average Pit 7 Powerplant Energy Generation for CP4	23-54
Table 23-42. Summary of Mitigation Measures for Power and Energy.....	23-57
Table 24-1. Ethnicity, Income, and Poverty Trends in Shasta and Tehama Counties and California	24-3
Table 24-2. Summary of Mitigation Measures for Environmental Justice.....	24-29
Table 25-1. Riverine Fish Species of the Lower McCloud River.....	25-15
Table 25-2. Summary of Mitigation Measures for Wild and Scenic Rivers	25-36
Table 27-1. Scoping Meeting Locations and Attendance	27-2

Figures

Figure 1-1. Shasta Dam and Shasta Lake Vicinity	1-10
Figure 1-2. Primary Study Area – Shasta Lake Area and Sacramento River from Shasta Dam to Red Bluff Diversion Dam.....	1-12
Figure 1-3. Central Valley Project and State Water Project Water Service Areas	1-15
Figure 2-1. Plan Formulation Phases	2-3
Figure 2-2. Conceptual Schematic of Restoration Actions as Enhancement Versus Restoration Actions as Mitigation	2-5
Figure 2-3. Vegetation Management Areas	2-27
Figure 2-4. Recreation Mitigation Study Windows	2-36
Figure 2-5. Potential Borrow Sources.....	2-41
Figure 2-6. Reading Island Conceptual Study Area	2-78
Figure 4-1. Geomorphic Provinces of California	4-3
Figure 4-2. Shasta Lake and Vicinity Portion of the Primary Study Area	4-4
Figure 4-3. Bedrock Geology – Shasta Lake and Vicinity	4-5
Figure 4-4. Locations of Mapped Slope Instability Hazards – Shasta Lake and Vicinity	4-18
Figure 4-5. Regional Stream Network and Boundaries of Watersheds Adjacent to Shasta Lake and Vicinity	4-24
Figure 4-6. Regional-Scale Characteristics of Streams Tributary to Shasta Lake.....	4-25
Figure 4-7. Soil Map Units – Shasta Lake and Vicinity	4-32
Figure 4-8. Stream Lengths in Watersheds Adjacent to Shasta Lake that Would Be Periodically Inundated Under Alternative CP1	4-58
Figure 4-9. Stream Lengths in Watersheds Adjacent to Shasta Lake that Would Be Periodically Inundated Under Alternative CP2.....	4-65
Figure 4-10. Stream Lengths in Watersheds Adjacent to Shasta Lake that Would Be Periodically Inundated Under Alternatives CP3, CP4, and CP5.....	4-71
Figure 5-1. Air Basins in California, Including the SCAQMD Area	5-2
Figure 7-1. Upper Sacramento River Primary Study Area	7-3
Figure 7-2. Concentrations of Suspended Sediment and Associated Flows in the Sacramento River above Big Bend near Red Bluff	7-9
Figure 7-3. Major Delta Islands, Waterways, Water Quality Control Stations, and Municipal and Industrial Intakes	7-40
Figure 8-1. Typical Noise Levels.....	8-4
Figure 9-1. Fire Hazard Severity and Historic Fires.....	9-3
Figure 10-1. Important Farmland in the Primary Study Area.....	10-9
Figure 10-2. Williamson Act Lands in the Primary Study Area.....	10-13
Figure 11-1. Approximate Timing of the Four Runs of Chinook Salmon in the Sacramento River.....	11-52
Figure 11-2. Monthly Surface Area (in acres) for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, Existing Condition vs. No-Action Alternative.....	11-68
Figure 11-3. Monthly Change in WSEL (in feet) for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, Existing Condition vs. No-Action Alternative.....	11-69

Figure 11-4. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP1 vs. Existing Condition	11-75
Figure 11-5. Monthly Change in Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP1 (2030) vs. No-Action Alternative	11-76
Figure 11-6. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP1 vs. Existing Condition	11-78
Figure 11-7. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP1 vs. No-Action Alternative	11-79
Figure 11-8. Monthly Cold-water Storage to Surface Area Ratio for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP1 vs. No-Action Alternative	11-81
Figure 11-9. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (Existing Condition)	11-107
Figure 11-10. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (No-Action Alternative).....	11-108
Figure 11-11. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP2 vs. Existing Condition	11-139
Figure 11-12. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP2 vs. No-Action	11-140
Figure 11-13. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP2 vs. Existing Condition	11-142
Figure 11-14. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP2 vs. No-Action	11-143
Figure 11-15. Monthly Cold-water Storage to Surface Area Ratio for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP2 vs. Existing Condition.....	11-144
Figure 11-16. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (Existing Condition)	11-158
Figure 11-17. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (No-Action Alternative).....	11-159
Figure 11-18. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP3 vs. Existing Condition	11-183
Figure 11-19. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP3 vs. No-Action Alternative	11-184
Figure 11-20. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP3 vs. Existing Condition	11-185

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Figure 11-21. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP3 vs. No-Action Alternative	11-186
Figure 11-22. Monthly Cold-water Storage to Surface Area Ratio for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP3 vs. Existing Condition.....	11-188
Figure 11-23. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (Existing Condition)	11-202
Figure 11-24. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (No-Action Alternative).....	11-203
Figure 11-25. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP4 vs. Existing Condition (2005).....	11-226
Figure 11-26. Monthly Surface Area for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP4 vs. No-Action Alternative	11-227
Figure 11-27. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP4 vs. Existing Condition (2005).....	11-229
Figure 11-28. Monthly Change in WSEL for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP4 vs. No-Action Alternative	11-230
Figure 11-29. Monthly Cold-water Storage to Surface Area Ratio for Each Water-Year Type Within the Shasta Lake Vicinity of the Primary Study Area, CP4 vs. Existing Condition.....	11-231
Figure 11-30. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (Existing Condition)	11-245
Figure 11-31. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area (No-Action Alternative).....	11-246
Figure 11-32. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area for Critical Years (Existing Condition)	11-247
Figure 11-33. Changes in Mean Monthly Water Temperature at Modeled Locations in the Sacramento River Within the Primary Study Area for Critical Years (No-Action Alternative)	11-248
Figure 12-1. Study Limits	12-3
Figure 12-2a. Manual of California Vegetation Types.....	12-9
Figure 12-2b. Manual of California Vegetation Types.....	12-11
Figure 12-2c. Manual of California Vegetation Types.....	12-13
Figure 12-2d. Manual of California Vegetation Types.....	12-15
Figure 12-2e. Manual of California Vegetation Types.....	12-17
Figure 12-2f. Manual of California Vegetation Types	12-19

Figure 12-3a. Special-Status Plant Species Occurring in Shasta Lake and Vicinity	12-39
Figure 12-3b. Special-Status Plant Species Occurring in Shasta Lake and Vicinity	12-41
Figure 12-3c. Special-Status Plant Species Occurring in Shasta Lake and Vicinity	12-43
Figure 12-3d. Special-Status Plant Species Occurring in Shasta Lake and Vicinity	12-45
Figure 12-3e. Special-Status Plant Species Occurring in Shasta Lake and Vicinity	12-47
Figure 12-3f. Special-Status Plant Species Occurring in Shasta Lake and Vicinity	12-49
Figure 12-5. Simulated Changes in Larger Mean Monthly Flows of the Sacramento River Below Keswick Dam	12-90
Figure 12-6. Simulated Changes in Larger Mean Monthly Flows of the Sacramento River Above Red Bluff	12-91
Figure 12-7. Simulated Changes in Larger Mean Monthly Flows of the Sacramento River at Wilkins Slough.....	12-96
Figure 12-8. Simulated Changes in Larger Mean Monthly Flows of the Sacramento River at Freeport	12-97
Figure 12-9. Locations along Lower Sacramento River.....	12-98
Figure 13-1. Study Limits	13-3
Figure 13-2a. California Wildlife Habitat Relationship Types.....	13-7
Figure 13-2b. California Wildlife Habitat Relationship Types	13-9
Figure 13-2c. California Wildlife Habitat Relationship Types.....	13-11
Figure 13-2d. California Wildlife Habitat Relationship Types	13-13
Figure 13-2e. California Wildlife Habitat Relationship Types.....	13-15
Figure 13-2f. California Wildlife Habitat Relationship Types	13-17
Figure 13-3a. Special-Status Wildlife Occurring in Shasta Lake and Vicinity	13-31
Figure 13-3b. Special-Status Wildlife Occurring in Shasta Lake and Vicinity	13-33
Figure 13-3c. Special-Status Wildlife Occurring in Shasta Lake and Vicinity	13-35
Figure 13-3d. Special-Status Wildlife Occurring in Shasta Lake and Vicinity	13-37
Figure 13-3e. Special-Status Wildlife Occurring in Shasta Lake and Vicinity	13-39
Figure 13-3f. Special-Status Wildlife Occurring in Shasta Lake and Vicinity.....	13-41
Figure 13-4a. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity	13-43
Figure 13-4b. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity	13-45
Figure 13-4c. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity	13-47
Figure 13-4d. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity	13-49
Figure 13-4e. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity	13-51
Figure 13-4f. Special-Status Terrestrial Mollusks Occurring in Shasta Lake and Vicinity	13-53
Figure 15-1. Reservations, Rancherias and Public Domain Allotments in Primary Study Area	15-3
Figure 17-1. Land Ownership Around Shasta Lake	17-3
Figure 18-1. Recreation Facilities in the Shasta Unit of the NRA.....	18-3
Figure 18-2. Recreation Facilities in the Upper Sacramento River Portion of the Primary Study Area	18-9

Shasta Lake Water Resources Investigation
Environmental Impact Statement

Figure 18-3. Number of Recreation Facility Infrastructure Items Affected by a 6.5-Foot Dam Raise Under CP1	18-34
Figure 18-4. Number of Recreation Facility Infrastructure Items Affected by a 12.5-Foot Dam Raise Under CP2	18-53
Figure 18-5. Number of Recreation Facility Infrastructure Items Affected by an 18.5-Foot Dam Raise Under CP3	18-65
Figure 19-1. Panoramic view of the Three Shastas (Shasta Dam, Shasta Lake, and Mount Shasta) as seen from the State Route 151 Vista Point	19-7
Figure 19-2. Typical View of Shasta Lake from a Lakeside Campsite (taken from the Dekkas Rock Campground, McCloud Arm)	19-7
Figure 19-3. Some of the Distinctive Landscape Features Visible from the Bridge Bay Resort, Including a Portion of the Bridge Bay Marina, the Pit River Bridge, and Dramatic Limestone Outcrops Along the McCloud Arm	19-8
Figure 19-4. Shasta Dam and Infrastructure	19-8
Figure 19-5. Examples of Built Features in the Primary Study Area	19-9
Figure 19-6. The “Bathtub Ring” Effect.....	19-10
Figure 19-7. View of Shasta Lake from a Residence Located off Northwoods Road, Lakehead, California	19-10
Figure 19-8a. Visual Assessment Unit and Key Observation Points.....	19-21
Photographs for Figure 19-8a, Page 1.....	19-22
Photographs for Figure 19-8a, Page 2.....	19-23
Photographs for Figure 19-8a, Page 3.....	19-24
Figure 19-8b. Visual Assessment Unit and Key Observation Points	19-25
Photographs for Figure 19-8b, Page 1	19-26
Figure 19-8c. Visual Assessment Unit and Key Observation Points.....	19-27
Photographs for Figure 19-8c, Page 1.....	19-28
Photographs for Figure 19-8c, Page 2.....	19-29
Figure 19-8d. Page 1 – Visual Assessment Unit and Key Observation Points.....	19-31
Figure 19-8d. Page 2 – Visual Assessment Unit and Key Observation Points.....	19-32
Photographs for Figure 19-8d, Page 1	19-33
Photographs for Figure 19-8d, Page 2	19-34
Photographs for Figure 19-8d, Page 3	19-35
Photographs for Figure 19-8d, Page 4	19-36
Photographs for Figure 19-8d, Page 5	19-37
Figure 19-8e. Page 1 – Visual Assessment Unit and Key Observation Points.....	19-39
Figure 19-8e. Page 2 – Visual Assessment Unit and Key Observation Points.....	19-40
Figure 19-8e. Page 3 – Visual Assessment Unit and Key Observation Points.....	19-41
Photographs for Figure 19-8e, Page 1.....	19-42
Photographs for Figure 19-8e, Page 2.....	19-43
Photographs for Figure 19-8e, Page 3.....	19-44
Photographs for Figure 19-8e, Page 4.....	19-45
Figure 19-8f. Page 1 – Visual Assessment Unit and Key Observation Points	19-47
Figure 19-8f. Page 2 – Visual Assessment Unit and Key Observation Points	19-48
Photographs for Figure 19-8f, Page 1	19-49
Photographs for Figure 19-8f, Page 2	19-50

Figure 19-8g. Visual Assessment Unit and Key Observation Points	19-51
Photographs for Figure 19-8g	19-52
Figure 19-8h. Page 1 – Visual Assessment Unit and Key Observation Points.....	19-53
Figure 19-8h. Page 2 – Visual Assessment Unit and Key Observation Points.....	19-54
Figure 19-8h. Page 3 – Visual Assessment Unit and Key Observation Points.....	19-55
Photographs for Figure 19-8h	19-56
Figure 20-1a. Affected Transportation Facilities – Key to the Sheets.....	20-9
Figure 20-1b. Affected Transportation Facilities – Map 1	20-11
Figure 20-1c. Affected Transportation Facilities – Map 2	20-13
Figure 20-1d. Affected Transportation Facilities – Map 3	20-15
Figure 20-1e. Affected Transportation Facilities – Map 4	20-17
Figure 20-1f. Affected Transportation Facilities – Map 5	20-19
Figure 20-1g. Affected Transportation Facilities – Map 6	20-21
Figure 21-1. Water Service Around Shasta Lake	21-3
Figure 21-2. Primary Utility Demolition and Relocation Areas.....	21-13
Figure 25-1. Lower McCloud River Study Area	25-2
Figure 25-2. Differences in State and Federal Segments and Transition Reach	25-5
Figure 25-3. Regional Location	25-10

Appendices

Glossary of Terms

Plan Formulation Appendix

Engineering Summary Appendix

Economic Valuation Appendix

Modeling Appendix

Real Estate Appendix

Climate Change Projection Appendix: Summary of Potential Climate Change Projections and Impacts on the Study Area Resources

Physical Resources Appendix

Geologic Technical Report

Hydrology, Hydraulics, and Water Management Technical Report

Water Quality Technical Report

Biological Resources Appendix

Fisheries and Aquatic Ecosystems Technical Report

Botanical Resources Technical Report

Wildlife Resources Technical Report

Cultural Resources Appendix

Cultural Technical Report (sensitive; not for public distribution)

Socioeconomics Appendix

Socioeconomics, Population, and Housing Technical Report

Power and Energy Technical Report

Fish and Wildlife Coordination Act Report Appendix

Abbreviations and Acronyms

°C	degree Celsius
°F	degrees Fahrenheit
AB	Assembly Bill
ABA	Americans with Disabilities Act
ACID	Anderson-Cottonwood Irrigation District
ADA	Americans with Disabilities Act
AFRP	Anadromous Fish Restoration Program
AFS	anadromous fish survival
APE	area of potential effect
AQAP	air quality attainment plan
ARB	Air Resources Board
BA	Biological Assessment
BAMM	best available mitigation measure
Banks	SWP Harvey O. Banks Pumping Plant
Basin Plan	<i>Water Quality Plan for the Sacramento and San Joaquin River Basins</i>
Bay Area	San Francisco Bay Area
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin River Delta
BDCP	Bay Delta Conservation Plan
BLM	U.S. Bureau of Land Management
BMP	best management practice
BO	Biological Opinion
BVWD	Bella Vista Water District
CAA	Clean Air Act
Cal/EPA	California Environmental Protection Agency
Cal/OSHA	California Occupational Safety and Health Administration
CALFED	CALFED Bay-Delta Program
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CBC	California Building Standards Code
CCAA	California Clean Air Act
CCCSD	Clear Creek Community Services District
CCR	California Code of Regulations
CCSD	Centerville Community Services District
CCWD	Contra Costa Water District
CDF	California Department of Forestry and Fire Protection

Shasta Lake Water Resources Investigation
Environmental Impact Statement

CDFA	California Department of Food and Agriculture
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHP	California Highway Patrol
CNDDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
COA	Coordinated Operations Agreement
CP	Comprehensive Plan
CRMP	coordinated resource management plan
CRPR	California Rare Plant Rank
CSA	Community Service Area
CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVPM	Central Valley Production Model
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationship
CWP	cold-water pool
D-1641	SWRCB Water Right Decision 1641
dB	decibel
dBA	A-weighted decibel
dBA/DD	dBA per doubling of distance
DCC	Delta Cross Channel
DEIS	Draft Environmental Impact Statement
Delta	Sacramento–San Joaquin River Delta
DFG	California Department of Fish and Game
diesel PM	diesel particulate matter
DO	dissolved oxygen

DOC	California Department of Conservation
DSM2	Delta Simulation Model 2
DWR	California Department of Water Resources
E/I	export/inflow
EC	electrical conductivity
EIR	environmental impact report
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERPP	Ecosystem Restoration Program Plan
ESA	Federal Endangered Species Act
EWA	Environmental Water Account
FCWA	Fish and Wildlife Coordination Act
Federal WSRA	Federal Wild and Scenic Rivers Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy and Management Act of 1976
FSZ	Farmland Security Zone
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GAMA	Groundwater Ambient Monitoring and Assessment
GHG	greenhouse gas
GIS	geographic information systems
GWh	gigawatt-hour
GWP	global warming potential
H&H	hydrology, hydraulics, and water management
HAP	hazardous air pollutant
HMBP	Hazardous Materials Business Plan
hp	horsepower
Hz	Hertz
I-5	Interstate 5
IMPLAN	IMpact analysis for PLANning
in/sec	inches per second
ITA	Indian Trust Assets
ITE	Institute of Transportation Engineers
Jones	C. W. “Bill” Jones Pumping Plant
JPOD	Joint Point of Diversion
KCSA	Keswick County Service Area
km	kilometer

Shasta Lake Water Resources Investigation
Environmental Impact Statement

KOP	key observation point
kV	kilovolt
lb/day	pounds per day
L _{dn}	day-night noise level
L _{eq}	equivalent noise level
L _{max}	maximum noise level
L _{min}	minimum noise level
LRMP	Land and Resource Management Plan
LSR	Late Successional Reserve
LTG	LongTermGen
L _x	statistical descriptor
M&I	municipal and industrial
MAF	million acre-feet
MBTA	Migratory Bird Treaty Act
MCV	<i>A Manual of California Vegetation</i>
mg/L	milligrams per liter
MGCSD	Mountain Gate Community Services District
mgd	million gallons per day
mmhos/cm	millimhos per centimeter
MMT	million metric tons
MOA	memorandum of agreement
MOU	memorandum of understanding
MSCS	Multi-Species Conservation Strategy
msl	mean sea level
MT	metric ton
MW	megawatt
MWh	megawatt-hours
NAHC	Native American Heritage Commission
NDOI	Net Delta Outflow Index
NEHRPA	National Earthquake Hazards Reduction Program Act
NEPA	National Environmental Policy Act
NFS	National Forest System
NGVD29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System

NPL	National Priorities List
NRA	National Recreation Area
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
NSR	North State Resources, Inc.
NSVAB	Northern Sacramento Valley Air Basin
NWP	Nationwide Permit
OCAP	Operations Criteria and Plan
OES	California Office of Emergency Services
OHV	off-highway vehicle
OHWM	ordinary high-water mark
OPR	Governor's Office of Planning and Research
ORV	outstandingly remarkable value
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PCT	Project Coordination Team
PDEIS	Preliminary Draft Environmental Impact Statement
PG&E	Pacific Gas and Electric Company
PM _{2.5}	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
PM ₁₀	respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
PPV	peak particle velocity
PRC	Public Resources Code
PUD	Public Utilities District
RABA	Redding Area Bus Authority
RBDD	Red Bluff Diversion Dam
RCD	resource conservation district
RCRA	Resource Conservation and Recovery Act
RD-1641	SWRCB Revised Water Right Decision 1641
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
Reporting Rule	Greenhouse Gas Reporting Rule
RHJV	Riparian Habitat Joint Venture
RM	river-mile
RMP	resource management plan
RMS	root mean squared
ROD	Record of Decision

Shasta Lake Water Resources Investigation
Environmental Impact Statement

ROG	reactive organic gas
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RPA	reasonable and prudent alternative
RV	recreational vehicle
RWQCB	regional water quality control board
SAFCA	Sacramento Area Flood Control Agency
SB	Senate Bill
SCAQMD	Shasta County Air Quality Management District
SCFD	Shasta County Fire Department
SCSD	Shasta Community Service District
SCSO	Shasta County Sheriff's Office
SCWA	Shasta County Water Agency
SDIP	South Delta Improvements Program
SDWA	Safe Drinking Water Act
SEL	single-event (impulsive) noise level
Shasta-Trinity LRMP	<i>Shasta-Trinity National Forest Land and Resource Management Plan</i>
SHPO	California State Historic Preservation Officer
Sierra Nevada Region	Sierra Nevada Customer Service Region
SIP	State Implementation Plan
SLC	State Lands Commission
SLWRI	Shasta Lake Water Resources Investigation
SMARA	Surface Mining and Reclamation Act of 1975
SMM	standard mitigation measures
SO ₂	sulfur dioxide
SR	State Route
SRA	shaded riverine aquatic
SRCA	Sacramento River Conservation Area
SRNWR	Sacramento River National Wildlife Refuge
SRTTG	Sacramento River Temperature Task Group
SRWRS	Sacramento River Water Reliability Study
State	State of California
STATSGO	State Soil Geographic Database
STNF	Shasta-Trinity National Forest
STNF LRMP	<i>Shasta-Trinity National Forest Land and Resource Management Plan</i>
SVAB	Sacramento Valley Air Basin
SVI	Sacramento Valley Index

SWP	State Water Project
SWP Power	SWP Power CA
SWPPP	storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminants
TAF	thousand acre-feet
TCD	temperature control device
TCFD	Tehama County Fire Department
TCP	Traditional Cultural Properties
TDS	total dissolved solids
TMDL	total maximum daily load
TNC	The Nature Conservancy
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAU	visual assessment unit
VdB	vibration decibel
VOC	volatile organic compound
VQO	visual quality objective
WDR	waste discharge requirement
Western	Western Area Power Administration
WOMT	Water Operations Management Team
WQCP	Water Quality Control Plan
WSEL	water surface elevation
WSR	water supply reliability
WSRA	Wild and Scenic Rivers Act
WUI	wildland-urban interface
WWTP	wastewater treatment plant
X2	distance in kilometers from the Golden Gate Bridge to the location where salinity concentration is 2 parts per thousand

Shasta Lake Water Resources Investigation
Environmental Impact Statement

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